Spook Hill ADMP Update

Flood Control District of Maricopa County

Appendix A
Volume 8

Hydraulics

Wood, Patel & Associates, Inc.
2051 West Northern Avenue
Suite 100
Phoenix, AZ 85021
Phone: (602) 335-8500
Fax: (602) 335-8580

Registered Professional Engineer (Civil)
CERTIFICATE NO.
28615
RICHARD L.
HINER
Date Signed 9-20-0
ARIZONA U.S.A.

Spook Hill Area Drainage Master Plan Update

Flood Control District of Maricopa County

List of Appendices

Appendix A

Volume 1	HEC-1 Modeling Input Data & Output Files – Level III
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Volume 3	TR-20 Hydrology Analysis
Volume 4	Design Alternative Analysis – Level I
Volume 5	Design Alternative Analysis – Level II
Volume 6	No-Action/Non-Structural Alternative Analysis
Volume 7	Conveyance Material Analysis
Volume 8	Hydraulics
Volume 9	Red Mountain Freeway Crude Cost Estimates

Property of
Flood Control District of MC Library
Please Return to
2801 W. Durango
Phoenix, AZ 85009

Appendix B

Volume 1	Level I – Hydrology (1999 – 03/10/2000)
Volume 2	Level I – Hydrology (03/10/2000 – 05/11/2000)
Volume 3	Level I – Hydrology (05/11/2000 – 06/19/2000)
Volume 4	Level I – Hydrology (06/19/2000 – 07/17/2000)
Volume 5	Level I – Hydrology (07/18/2000 – 07/27/2000)
Volume 6	Level I – Hydrology (12/06/2000)
Volume 7A	HEC-1 Modeling Output Files (Level II)
Volume 7B	HEC-1 Modeling Output Files (Level II)
Volume 7C	HEC-1 Modeling Output Files (Level II)

Registered Professional Engineer (Civil)
CERTIFICATE NO.
28615
RICHARD L.
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Date Signed 9-20-02
ARIZONA U.S.A.

WOOD/PATEL

CIVIL ENGINEERS • HYDROLOGISTS • LAND SURVEYORS

PROJECT Spook Hill ADMP

PROJECT NO. 99989 SHEET NO. 1 OF

CALCULATED BY RLH DATE 5/15 CHECKED BY DATE

	Alternative	Contributing Subbasins	Area
1	Existing Pass Mountain	190, 200, 210, 220, 240	3.46 mi²
2	Extend PM Diversion	+ 310 + 5% of 320 + 30% of 300 + 40% of 350	+ 1.07 = 4.53 mi²
3	Diversion along top of PM Highlands	+ 100% of 350 + 30% of 355	+ 0.77 = 5.30 mi²
4	Dike West of Usery Pass	+ 80% of 355 + 35% of 370	+ 0.58 = 5.88 mi²
5	Channel + Dike west of UP	+ 65% of 370 + 70% of 385 + 35% of 395	+ 0.72 = 6.60 mi²

SB	Volume		
190	62		
200	37		
210	54		
220	50		
240	34		
300	58	× 30%	= 17.4
310	24	× 100%	= 24
320	68	× 5%	= 3.4
350	53	× 100%	= 53
355	36	× 80%	= 28.8
370	43	× 65%	= 27.95
385	48	× 70%	= 33.6
395	13	× 35%	= 4.55
			192.7 acre-feet

C180	828 acre feet	Max
SR180	453 acre-feet	Max
180C	694 acre feet	Max

Signal Butte

Max Volume = 1060 acre feet

Max Used (Exist) = 828 acre feet

Alt. 5 = 828 + 193 = 1021 acre-fee

WOOD/PATEL

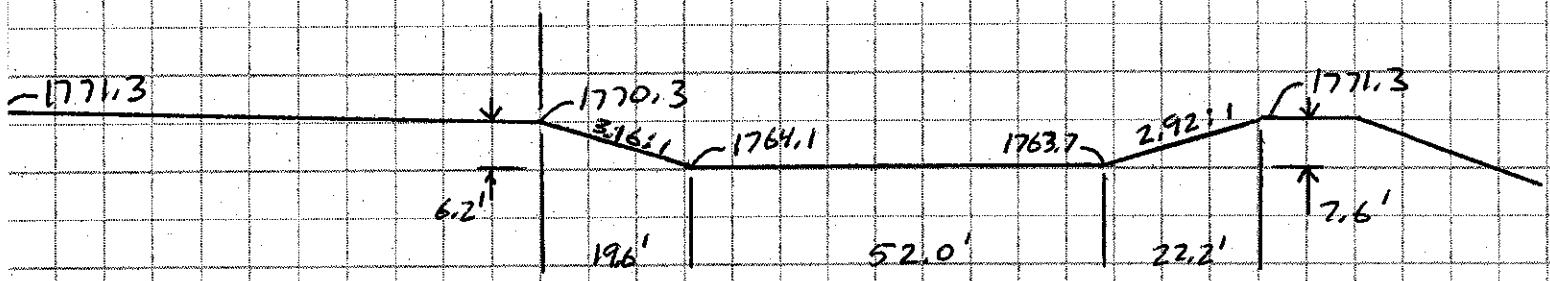
CIVIL ENGINEERS • HYDROLOGISTS • LAND SURVEYORS

PROJECT Spook Hill ADMP

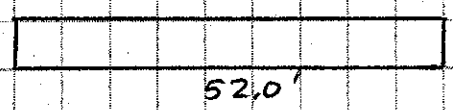
PROJECT NO. 99989 SHEET NO. ____ OF ____

CALCULATED BY RLH DATE 5/3/00 CHECKED BY ____ DATE ____

PASS MOUNTAIN DIVERSION – WIER #2



Use Superposition



	Q (cfs)
Broad Crested	3,231.4
Sharp Crested	3,234.5
V-Notch	369.6

Broad Crested + V-Notch

$$3231.4 + 369.6 = 3{,}601 \text{ cfs}$$

Pass Mountain Diversion Wier #2
Worksheet for Broad Crested Weir

Project Description	
Worksheet	Weir - 1
Type	Broad Crested Weir
Solve For	Discharge

Input Data		
Headwater Elevation	1,771.30	ft
Crest Elevation	1,763.90	ft
Tailwater Elevation	1,763.90	ft
Crest Surface Type	Gravel	
Crest Breadth	18.50	ft
Crest Length	52.00	ft

Results		
Discharge	3,231.38	cfs
Headwater Height Above Crest	7.40	ft
Tailwater Height Above Crest	0.00	ft
Discharge Coefficient	3.09	US
Submergence Factor	1.00	
Adjusted Discharge Coefficient	3.09	US
Flow Area	384.8	ft^2
Velocity	8.40	ft/s
Wetted Perimeter	66.80	ft
Top Width	52.00	ft

Worksheet
Worksheet for Sharp Crested Rectangular Weir

Project Description	
Worksheet	Weir - 2
Type	Sharp Crested Rectangular Weir
Solve For	Discharge

Input Data		
Headwater Elevation	1,771.30	ft
Crest Elevation	1,763.90	ft
Tailwater Elevation	1,763.90	ft
Discharge Coefficient	3.09	US
Crest Length	52.00	ft
Number of Contractions	0	

Results		
Discharge	3,234.52	cfs
Headwater Height Above Crest	7.40	ft
Tailwater Height Above Crest	0.00	ft
Flow Area	384.8	ft^2
Velocity	8.41	ft/s
Wetted Perimeter	66.80	ft
Top Width	52.00	ft

Worksheet
Worksheet for Sharp Crested V-Notch Weir

Project Description	
Worksheet	Weir - 3
Type	Sharp Crested V-Notch Weir
Solve For	Discharge

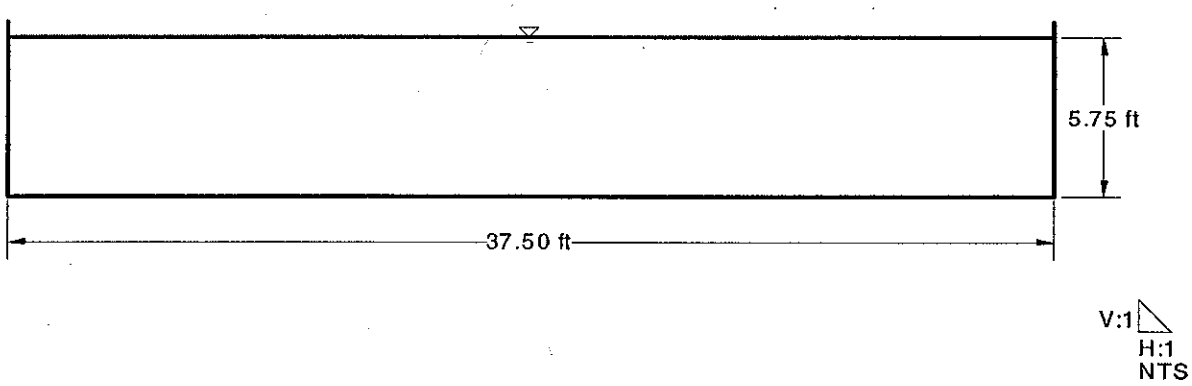
Input Data		
Headwater Elevation	1,771.30	ft
Crest Elevation	1,763.90	ft
Tailwater Elevation	1,763.90	ft
V-Notch Weir Coefficient	0.58	
Notch Angle	90.00	degrees

Results		
Discharge	369.64	cfs
Headwater Height Above Crest	7.40	ft
Tailwater Height Above Crest	0.00	ft
Flow Area	54.8	ft^2
Velocity	6.75	ft/s
Wetted Perimeter	20.93	ft
Top Width	14.80	ft

Apache Junction Floodway Section C-C
Cross Section for Rectangular Channel

Project Description	
Worksheet	Apache Junction Floodway Section C-C
Flow Element	Rectangular Channel
Method	Manning's Formula
Solve For	Discharge

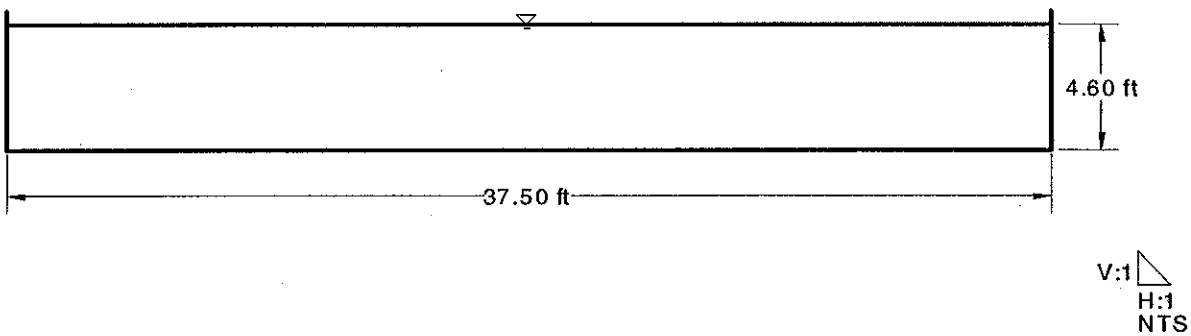
Section Data		
Mannings Coefficient	0.015	
Slope	0.002400	ft/ft
Depth	5.75	ft
Bottom Width	37.50	ft
Discharge	2,810.03	cfs



Apache Junction Floodway Section C-C - 20% FB
Cross Section for Rectangular Channel

Project Description	
Worksheet	Apache Junction Floodway Section C-C
Flow Element	Rectangular Channel
Method	Manning's Formula
Solve For	Discharge

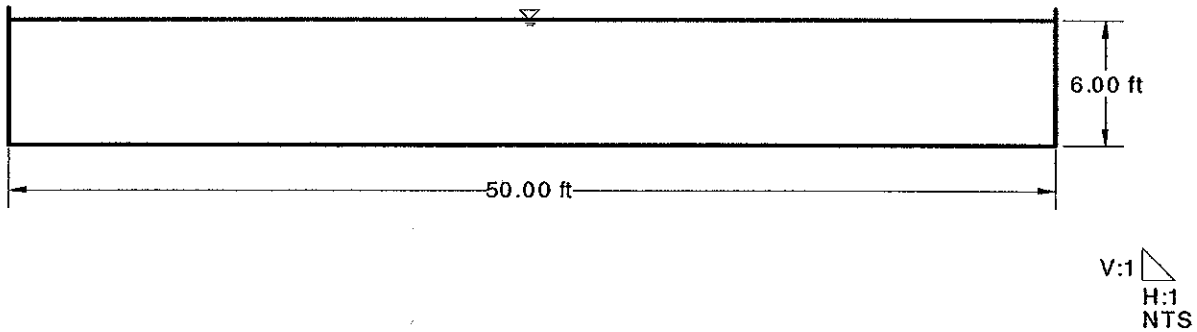
Section Data		
Mannings Coefficient	0.015	
Slope	0.002400	ft/ft
Depth	4.60	ft
Bottom Width	37.50	ft
Discharge	2,000.38	cfs



Bulldog Floodway Section B-B (Sht 2-10)
Cross Section for Rectangular Channel

Project Description	
Worksheet	Bulldog Floodway Section B-B (Sht 2-10)
Flow Element	Rectangular Channel
Method	Manning's Formula
Solve For	Discharge

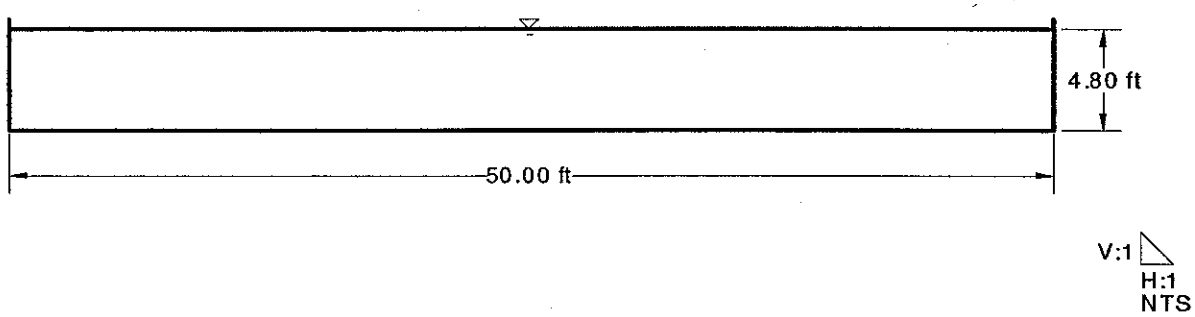
Section Data		
Mannings Coefficient	0.015	
Slope	0.005100	ft/ft
Depth	6.00	ft
Bottom Width	50.00	ft
Discharge	6,071.51	cfs



Bulldog Floodway Section B-B (Sht 2-10) - 20% FB
Cross Section for Rectangular Channel

Project Description	
Worksheet	Bulldog Floodway Section B-B (Sht 2-10)
Flow Element	Rectangular Channel
Method	Manning's Formula
Solve For	Discharge

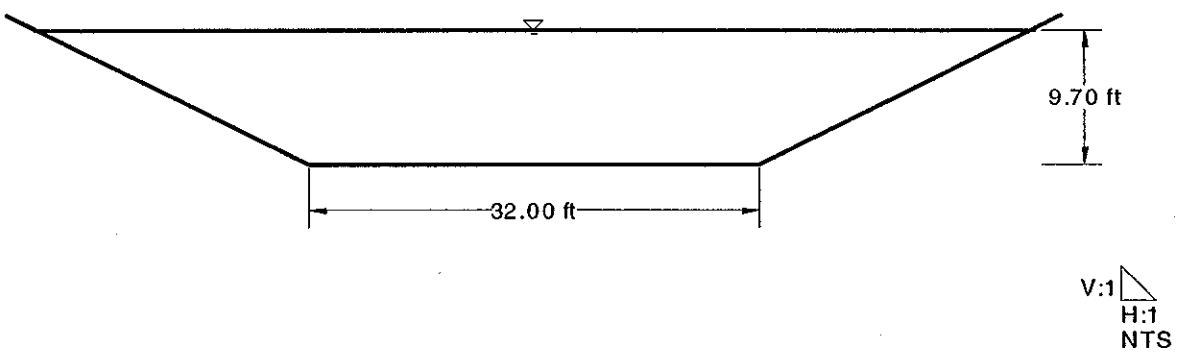
Section Data		
Mannings Coefficient	0.015	
Slope	0.005100	ft/ft
Depth	4.80	ft
Bottom Width	50.00	ft
Discharge	4,297.44	cfs



Signal Butte Floodway - 80+50 - 90+00
Cross Section for Trapezoidal Channel

Project Description	
Worksheet	Signal Butte Floodway - 80+50 - 90+00
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Discharge

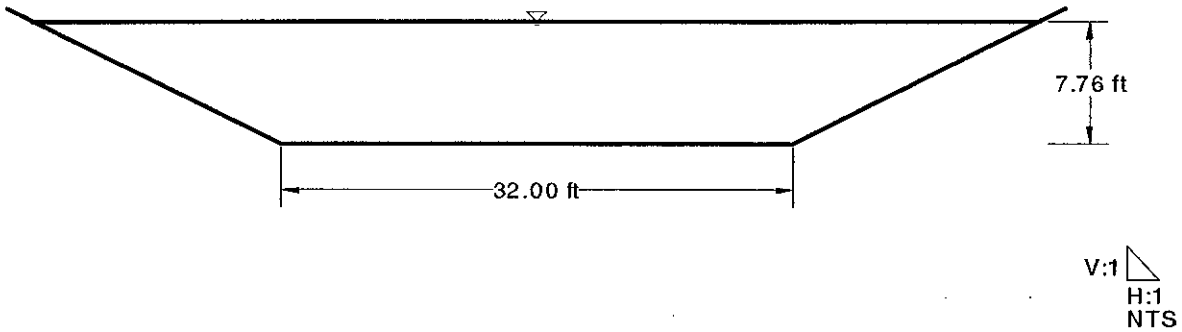
Section Data		
Mannings Coefficient	0.025	
Slope	0.000300	ft/ft
Depth	9.70	ft
Left Side Slope	2.00	H : V
Right Side Slope	2.00	H : V
Bottom Width	32.00	ft
Discharge	1,808.58	cfs



Signal Butte Floodway - 80+50 - 90+00 - 20% FB
Cross Section for Trapezoidal Channel

Project Description	
Worksheet	Signal Butte Floodway - 80+50 - 90+00
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Discharge

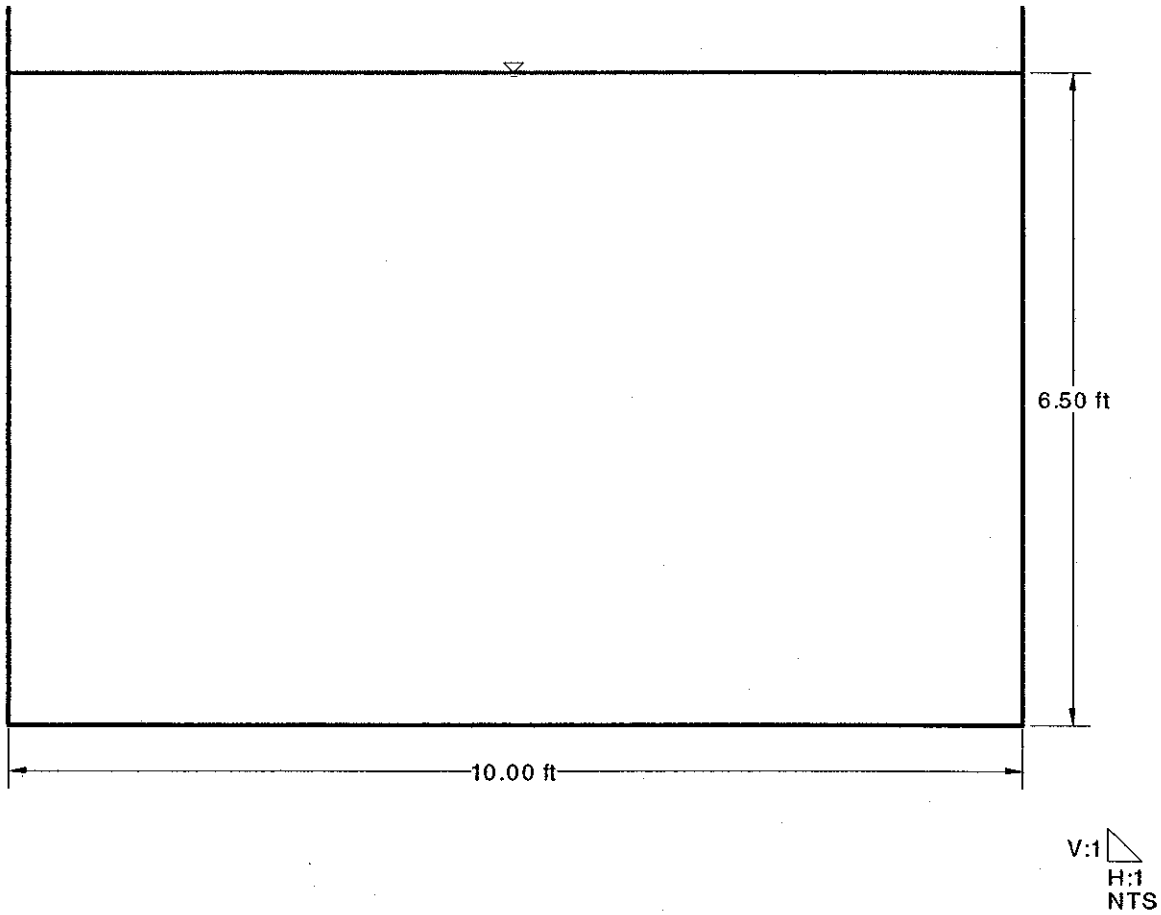
Section Data		
Mannings Coefficient	0.025	
Slope	0.000300	ft/ft
Depth	7.76	ft
Left Side Slope	2.00	H : V
Right Side Slope	2.00	H : V
Bottom Width	32.00	ft
Discharge	1,186.90	cfs



Signal Butte Floodway - 100+00 - No FB
Cross Section for Rectangular Channel

Project Description	
Worksheet	Signal Butte Floodway - 100+00
Flow Element	Rectangular Channel
Method	Manning's Formula
Solve For	Discharge

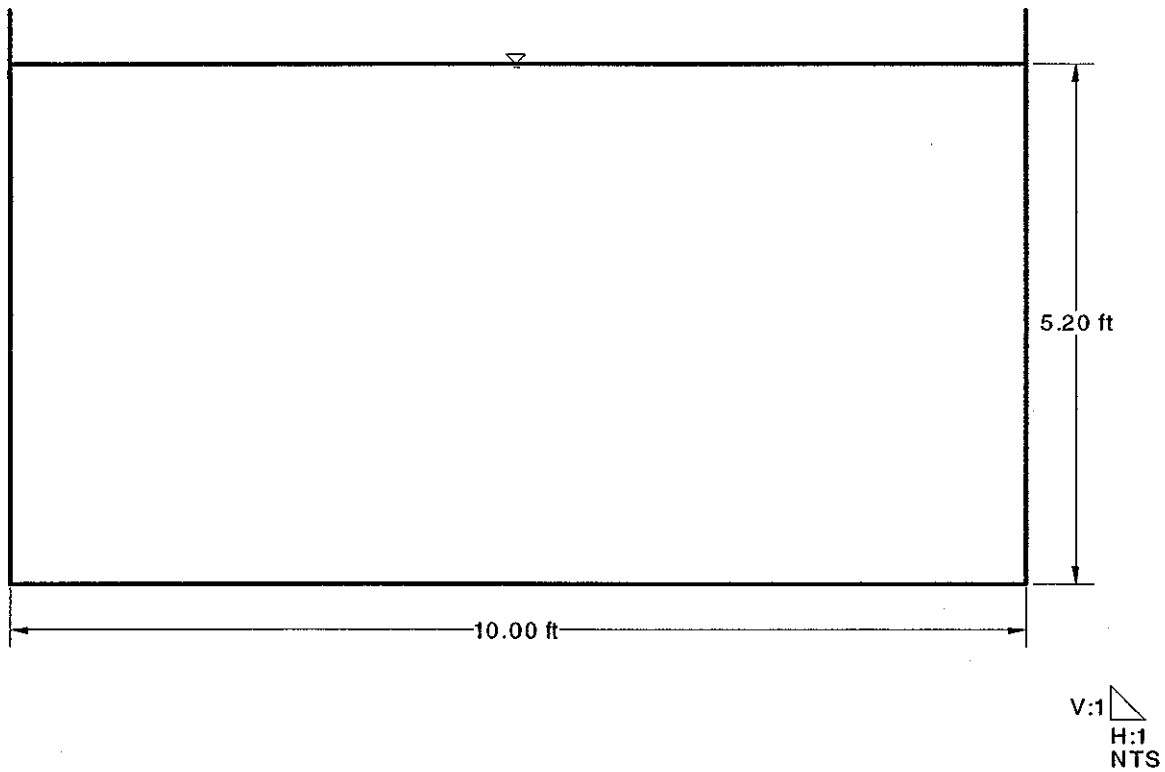
Section Data		
Mannings Coefficient	0.015	
Slope	0.013800	ft/ft
Depth	6.50	ft
Bottom Width	10.00	ft
Discharge	1,511.98	cfs



Signal Butte Floodway - 100+00 - 20% FB
Cross Section for Rectangular Channel

Project Description	
Worksheet	Signal Butte Floodway - 100+00
Flow Element	Rectangular Channel
Method	Manning's Formula
Solve For	Discharge

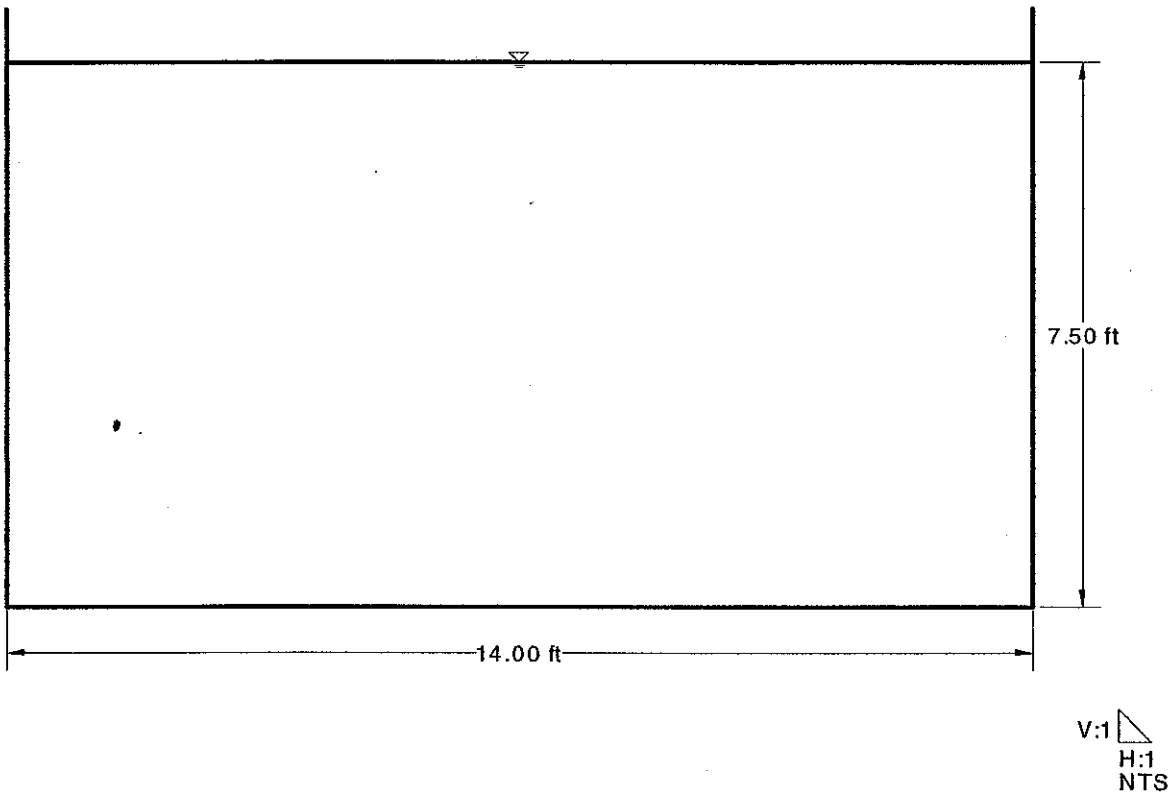
Section Data		
Mannings Coefficient	0.015	
Slope	0.013800	ft/ft
Depth	5.20	ft
Bottom Width	10.00	ft
Discharge	1,129.18	cfs



Signal Butte Floodway - 153+00 - No FB
Cross Section for Rectangular Channel

Project Description	
Worksheet	Signal Butte Floodway - 153+00
Flow Element	Rectangular Channel
Method	Manning's Formula
Solve For	Discharge

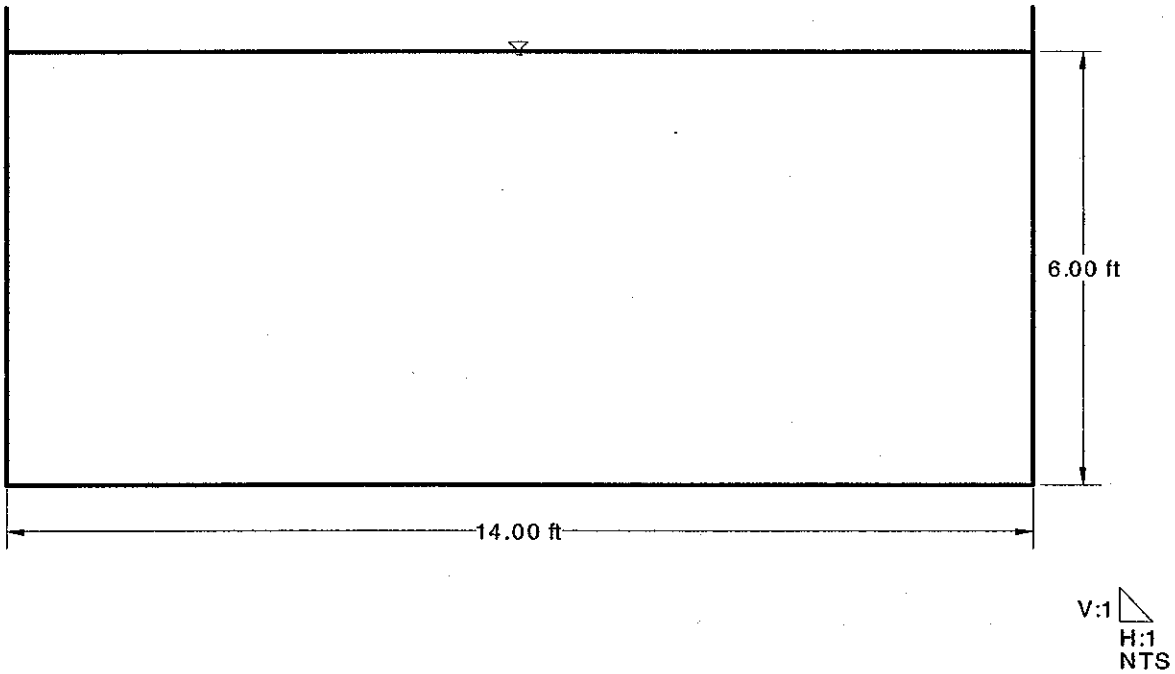
Section Data		
Mannings Coefficient	0.015	
Slope	0.015600	ft/ft
Depth	7.50	ft
Bottom Width	14.00	ft
Discharge	3,063.25	cfs



Signal Butte Floodway - 153+00 - 20% FB
Cross Section for Rectangular Channel

Project Description	
Worksheet	Signal Butte Floodway - 153+00
Flow Element	Rectangular Channel
Method	Manning's Formula
Solve For	Discharge

Section Data		
Mannings Coefficient	0.015	
Slope	0.015600	ft/ft
Depth	6.00	ft
Bottom Width	14.00	ft
Discharge	2,271.34	cfs



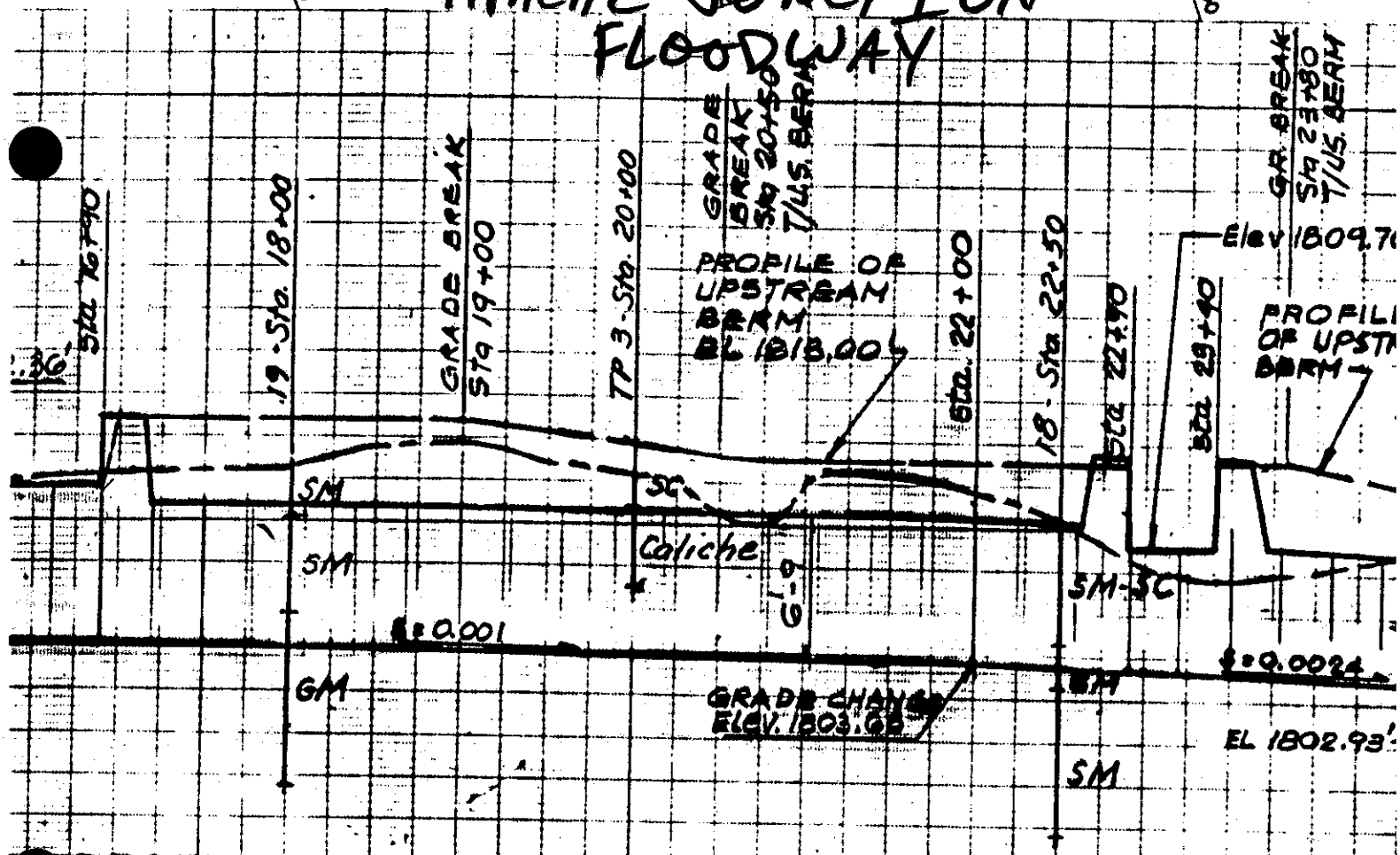
SPOOKHILL AREA DRAINAGE MASTER PLAN UPDATE

HYDRAULICS DOCUMENTATION

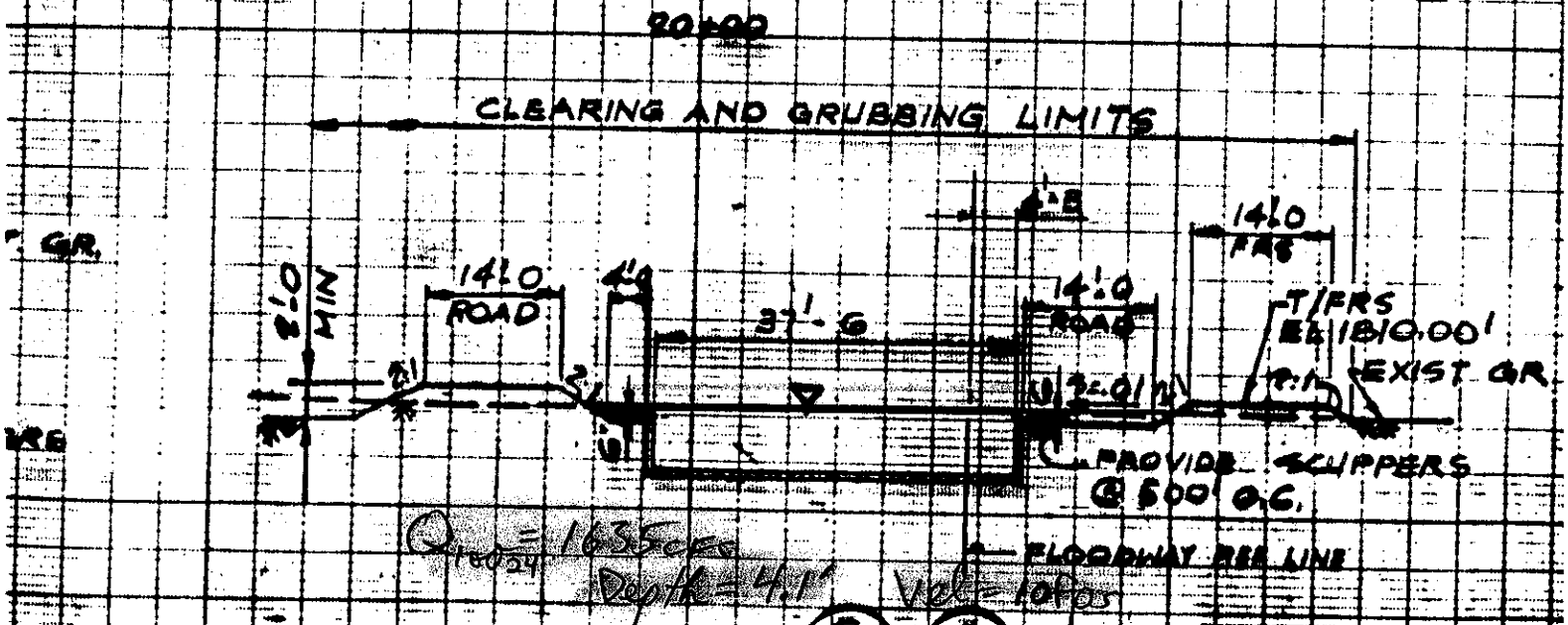
100-YEAR, 24HR DISCHARGES OF 4/13/2000 - FILE: s24ce0.dat

HEC-1 ID	LOCATION
C20	APACHE JUNCTION FLOODWAY (RECTANGULAR CONCRETE CHANNEL) Q100 = 1635cfs; Depth = 4.1'; Vel = 10.0fps
R120	BULLDOG FLOODWAY (RECTANGULAR CONCRETE CHANNEL) Q100 = 5400cfs; Depth = 5.8'; Vel = 18.6fps
300C	SIGNAL BUTTE FLOODWAY (TRAPEZOIDAL NATURAL CHANNEL) Q100 = 1770cfs; Depth = 5.1'; Vel = 8.1fps
C320	SIGNAL BUTTE FLOODWAY @ SPOOKHILL FRS (RECTANGULAR CONCRETE CHANNEL) Q100 = 2532cfs; Depth = 6.8'; Vel = 26.0fps

APACHE JUNCTION FLOODWAY



PROFILE



$Q_{100/24} = 1635$ cfs
Depth = 4.1' Vel = 10 fps

SECTION C/4 C/5

NO	DATE	REVISIONS
2		REVISED PER COMMENTS
1	9.15.00	ADD PROFILE OF EXTENSION; REV. ACCESS; ADD

AS BUILT

COMPLETION DATE 12/19/88

Apache Junction Floodway
Worksheet for Irregular Channel

Project Description	
Project File	p:\instal~1\public~1\window~1\fmw\spookhil.fm2
Worksheet	Apache Junction Floodway - Complete
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

Input Data

Channel Slope 0.002400 ft/ft

Elevation range: 0.00 ft to 5.00 ft.

Station (ft)	Elevation (ft)	Start Station	End Station	Roughness
0.00	5.00	0.00	8.00	0.025
4.00	3.00	8.00	45.50	0.016
8.00	3.00	45.50	59.50	0.025
8.00	0.00			
45.50	0.00			
45.50	3.00			
59.50	4.50			

Discharge 1635.00 ft^3/s

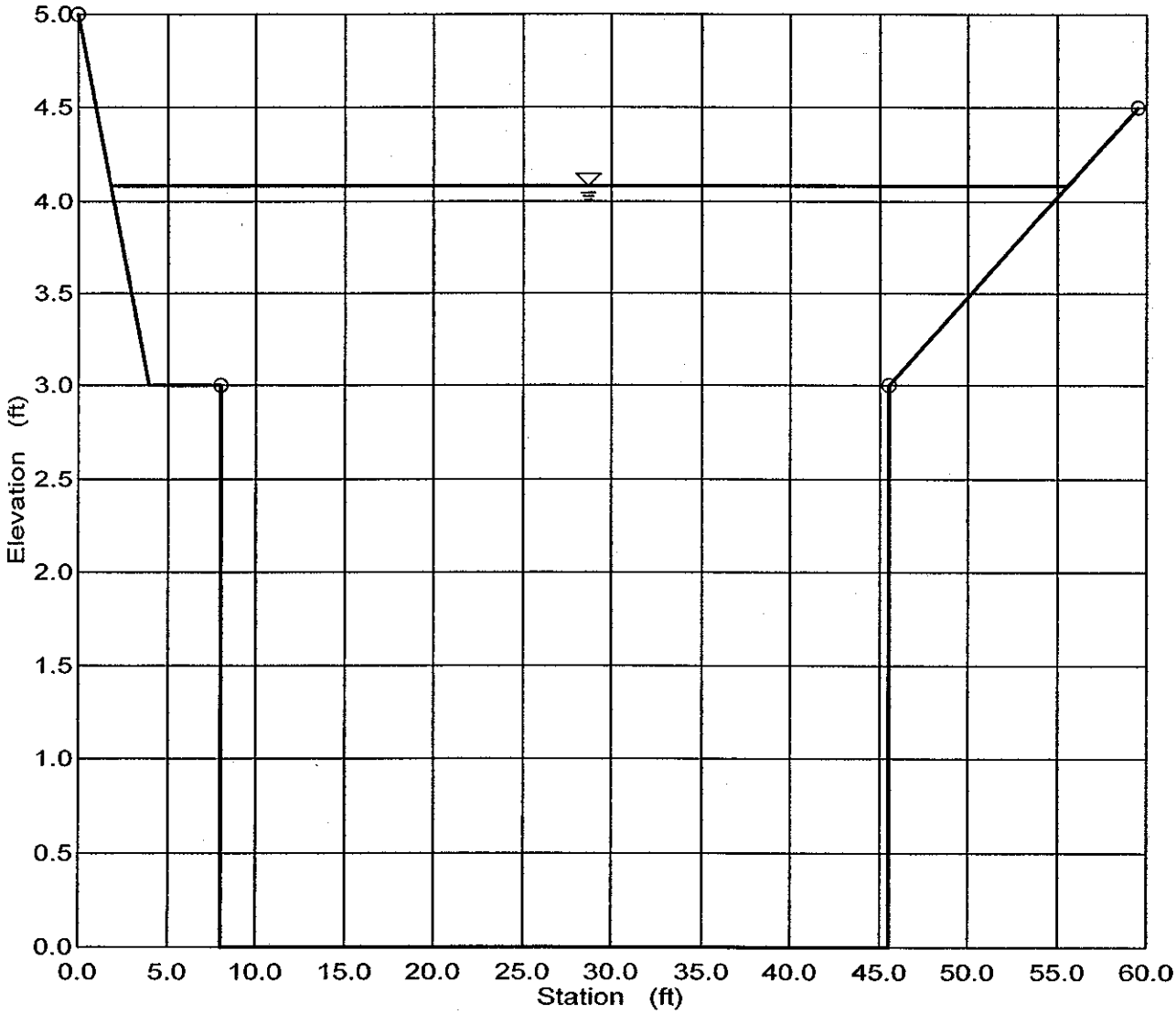
Results		
Wtd. Mannings Coefficient	0.014	
Water Surface Elevation	4.08	ft
Flow Area	163.95	ft^2
Wetted Perimeter	60.06	ft
Top Width	53.74	ft
Depth	4.08	ft
Critical Water Elev.	4.10	ft
Critical Slope	0.002365	ft/ft
Velocity	9.97	ft/s
Velocity Head	1.55	ft
Specific Energy	5.63	ft
Froude Number	1.01	
Full Flow Capacity	2361.00	ft^3/s

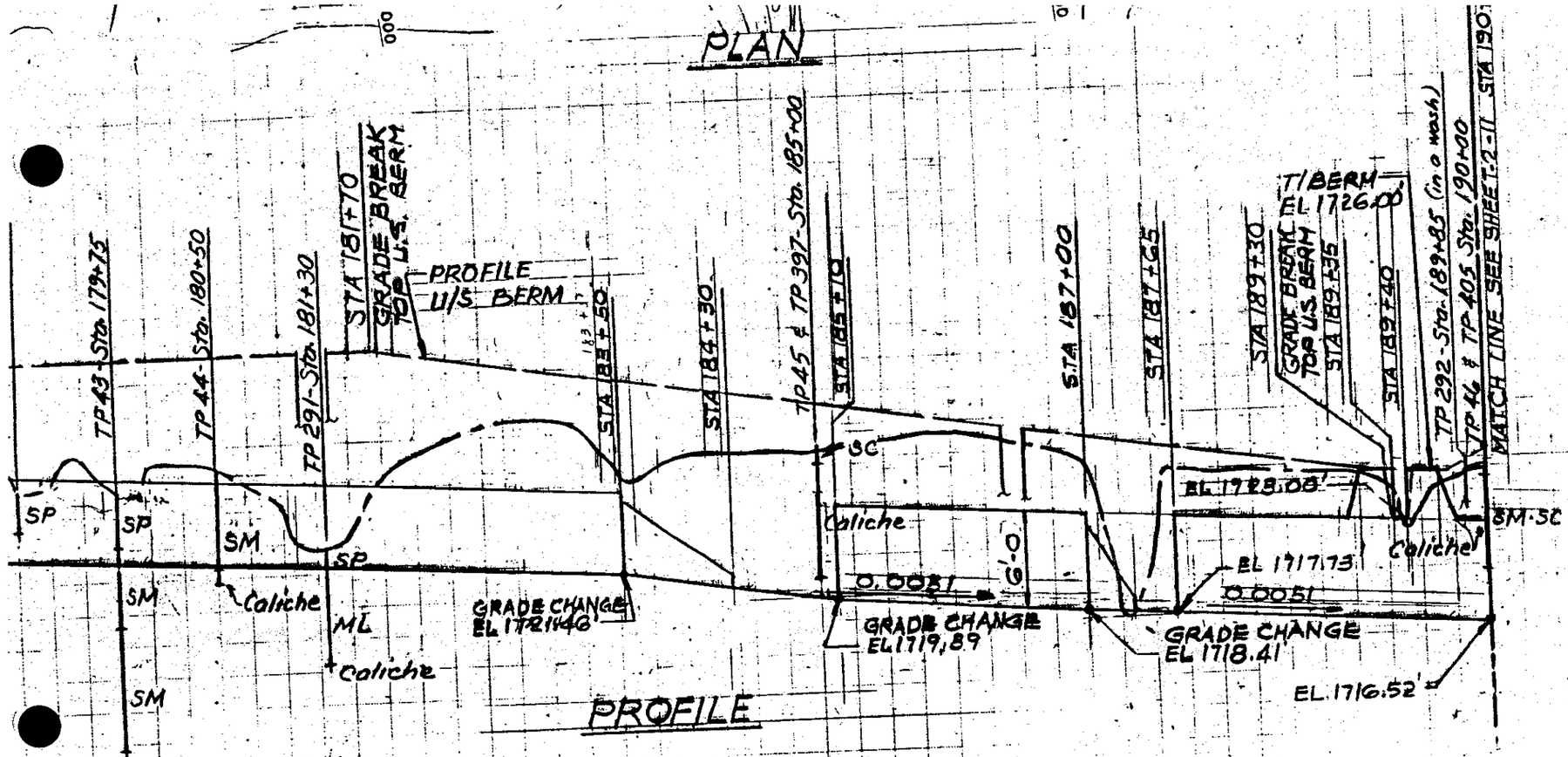
Flow is supercritical.

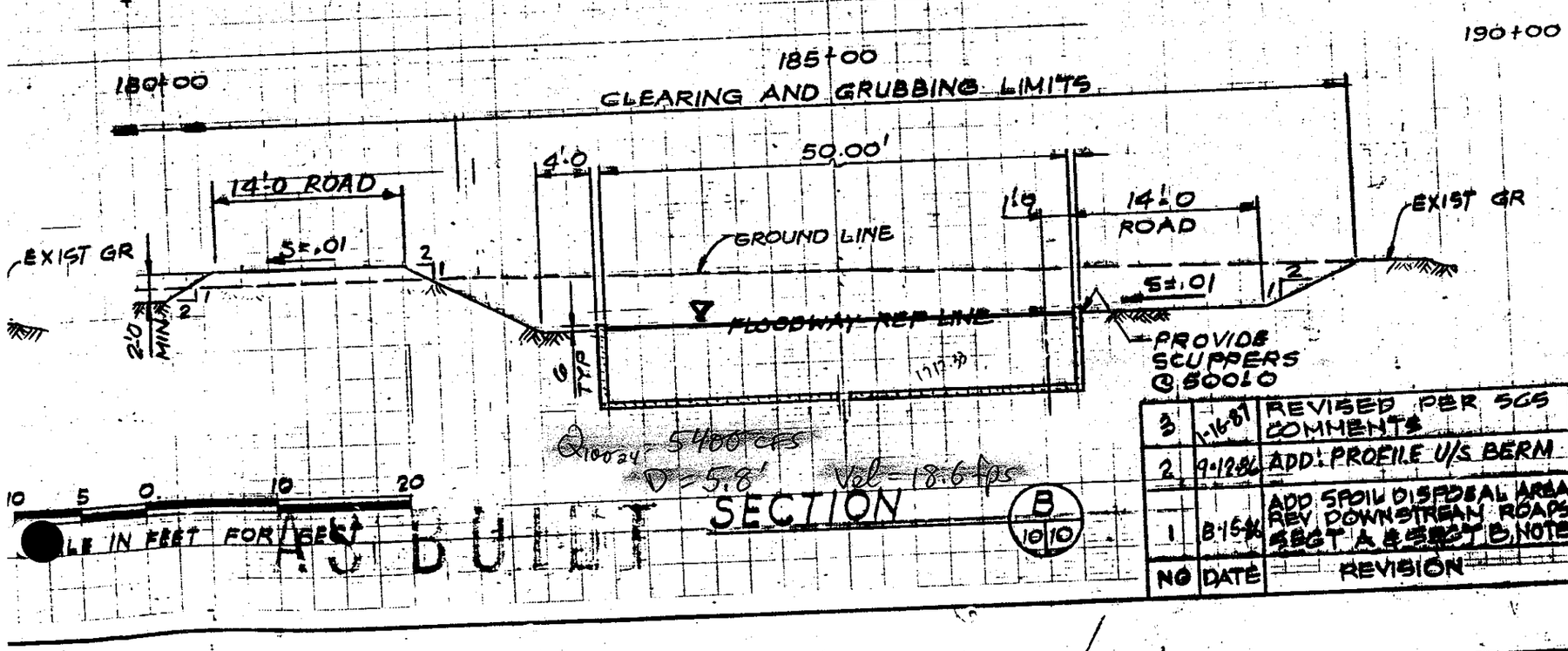
Apache Junction Floodway
Cross Section for Irregular Channel

Project Description	
Project File	p:\instal~1\public~1\window~1\fmw\spookhil.fm2
Worksheet	Apache Junction Floodway - Complete
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

Section Data		
Wtd. Mannings Coefficient	0.014	
Channel Slope	0.002400	ft/ft
Water Surface Elevation	4.08	ft
Discharge	1635.00	ft³/s







AS BUILT

NOTES:

A: SURFACE GRADE TO BE SLOPED TOWARDS WALL SCU "Y", SHT 2-5.

SURFACE DRAINAGE ALONG OUTSIDE OF NORTH MAI BE PROVIDED BY SLOPING THE FINISHED GRADE T WEIR INLET OR DOWNSTREAM SIDE CHANNEL INLET CUT AND FILL AS REQUIRED. SEE TYPICAL SECTIO

PROFILE OF EXISTING GRADE IS TAKEN A REFERENCE LINE.

PROFILE SHOWS THE NORTH ELEVATION OF FLOOD

SURFACE GRADING IS TO BE DONE TO ELIMINATE LOW SPOTS AND PROVIDE DRAINAGE TO INLETS.

FINAL ALIGNMENT OF U.S. BERMS TO BE DETERM BY THE ENGINEER

LEGEND:

SHOWS WHERE MAINTENANCE ROA EXISTING GRADE.

AS BUILT

COMPLETION DATE 12/19/88

NO	DATE	REVISION	BY	CH	APPROVED
3	1-16-81	REVISED PER SCS COMMENTS	LN	AP	DG
2	9-12-86	ADD: PROFILE U/S BERM	SG	DG	DG
1	8-15-86	ADD SPOIL DISPOSAL AREA REV DOWNSTREAM ROADS SECT A & SECT B, NOTE	LN	AP	DG

EBASCO EBASCO SERVICES

DIV CIVIL	DR. LN	CH MB	DATE 3/21/86	AP

PLAN & PRO
STA 175+00 TO ST

BULLDOG FLO
BUCKHORN - MES
PINAL AND MARICOPA COU

U. S. DEPARTMENT OF A
SOIL CONSERVATIO

Designed _____ Date _____ Approved _____
Drawn EFS 7-84 Title _____
Traced _____ Title _____
Checked _____ Sheet No 2-10 of 60

Bulldog Floodway
Worksheet for Irregular Channel

Project Description	
Project File	p:\instal~1\public~1\window~1\fmw\spookhil.fm2
Worksheet	Bulldog Floodway
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

Input Data

Channel Slope 0.005100 ft/ft

Elevation range: 0.00 ft to 11.00 ft.

Station (ft)	Elevation (ft)	Start Station	End Station	Roughness
0.00	11.00	0.00	14.00	0.025
10.00	6.00	14.00	64.00	0.016
14.00	6.00	64.00	84.00	0.025
14.00	0.00			
64.00	0.00			
64.00	6.00			
78.00	6.00			
84.00	9.00			

Discharge 5400.00 ft^3/s

Results

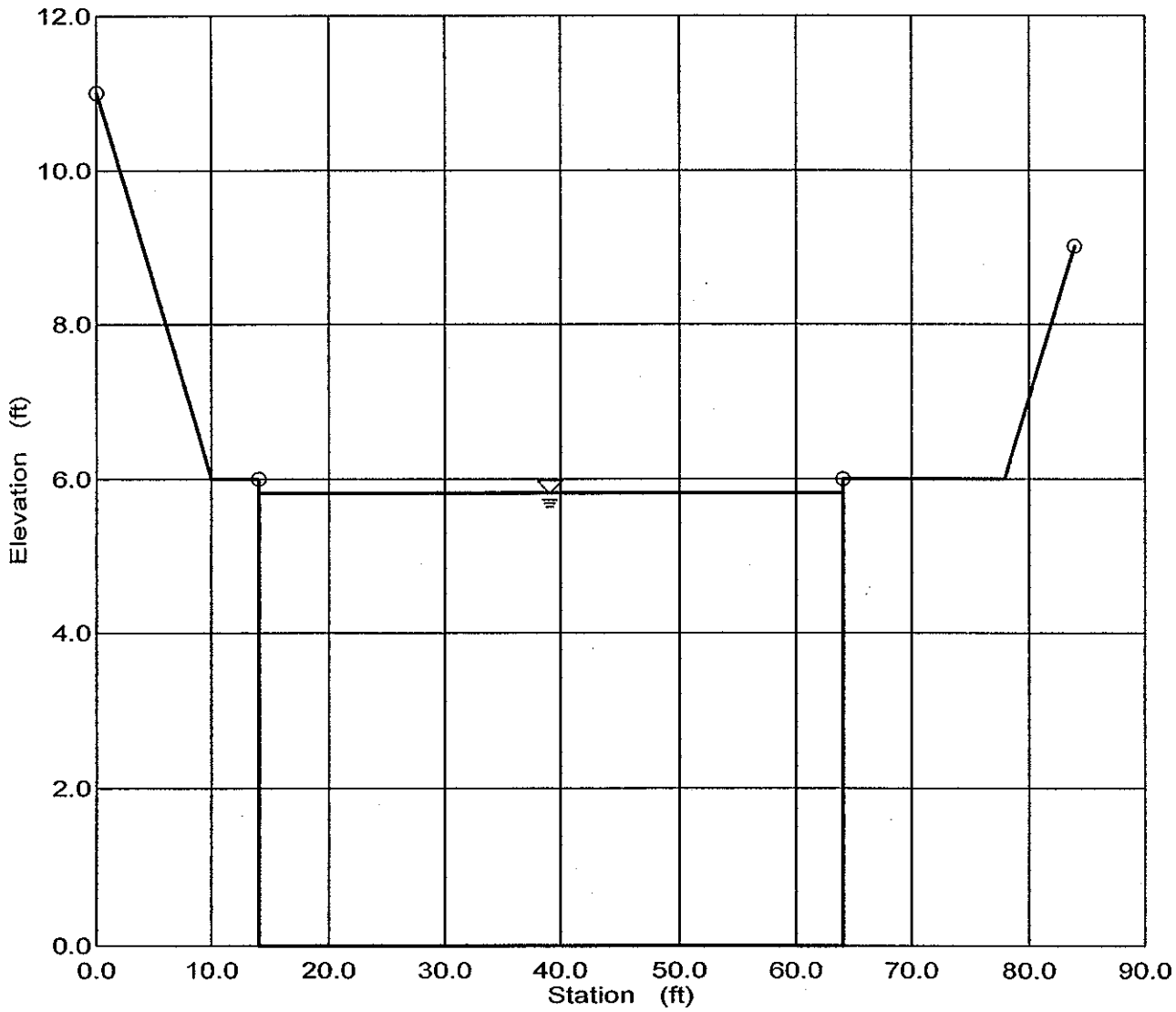
Wtd. Mannings Coefficient	0.016	
Water Surface Elevation	5.80	ft
Flow Area	289.91	ft^2
Wetted Perimeter	61.60	ft
Top Width	50.00	ft
Depth	5.80	ft
Critical Water Elev.	7.50	ft
Critical Slope	0.002104	ft/ft
Velocity	18.63	ft/s
Velocity Head	5.39	ft
Specific Energy	11.19	ft
Froude Number	1.36	
Full Flow Capacity	17000.28	ft^3/s

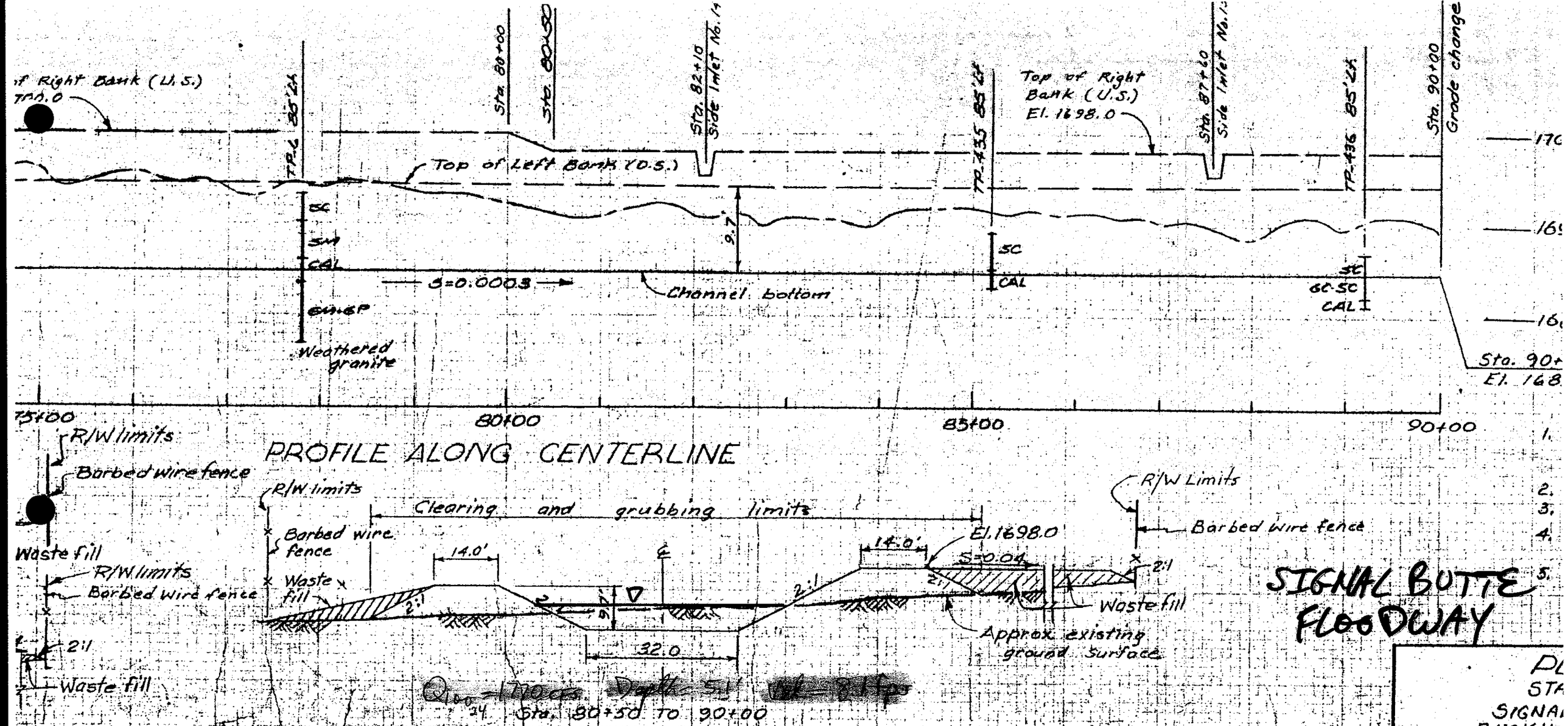
Flow is supercritical.

Bulldog Floodway
Cross Section for Irregular Channel

Project Description	
Project File	p:\instal~1\public~1\window~1\fmw\spookhil.fm2
Worksheet	Bulldog Floodway
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

Section Data		
Wtd. Mannings Coefficient	0.016	
Channel Slope	0.005100	ft/ft
Water Surface Elevation	5.80	ft
Discharge	5400.00	ft^3/s





PROFILE ALONG CENTERLINE

SIGNAL BUTTE FLOODWAY

Q_{100} = 1710 cfs. Depth = 5.1' Vel = 8.1 fps

Sta. 80+50 TO 90+00

CROSS SECTIONS

80+00 TO 90+00

(Sheet 5 of 12)

EARTH CHANNEL DATA

Sta. To Sta.	Bottom width	Description
70+00 – 71+13.21	20'	
71+13.21 – 72+17.21		RCC Box Culvert
72+17.21 – 73+37.21	20' to 32'	Transition
73+37.21 – 75+85	32'	
75+85 – 77+21	32' to 32'	Transition to Level Bottom *
77+21.20 – 90+00	32'	

S = 0.00030 Z = 2:1

* See Sheet 16

PL
STA
SIGNAL
BUCKHO
MARICOPA &

U.S. DEPAR
SOIL CO

Designed AEK, LLB

Drawn M.S.

Traced

Checked P.J.M.

Signal Butte Floodway - Natural Channel
Worksheet for Irregular Channel

Project Description	
Project File	p:\instal~1\public~1\window~1\fmw\spookhil.fm2
Worksheet	Signal Butte Floodway
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

Input Data

Channel Slope 0.003000 ft/ft

Elevation range: 0.00 ft to 9.70 ft.

Station (ft)	Elevation (ft)	Start Station	End Station	Roughness
0.00	9.70	0.00	70.80	0.025
19.40	0.00			
51.40	0.00			
70.80	9.70			

Discharge 1770.00 ft^3/s

Results

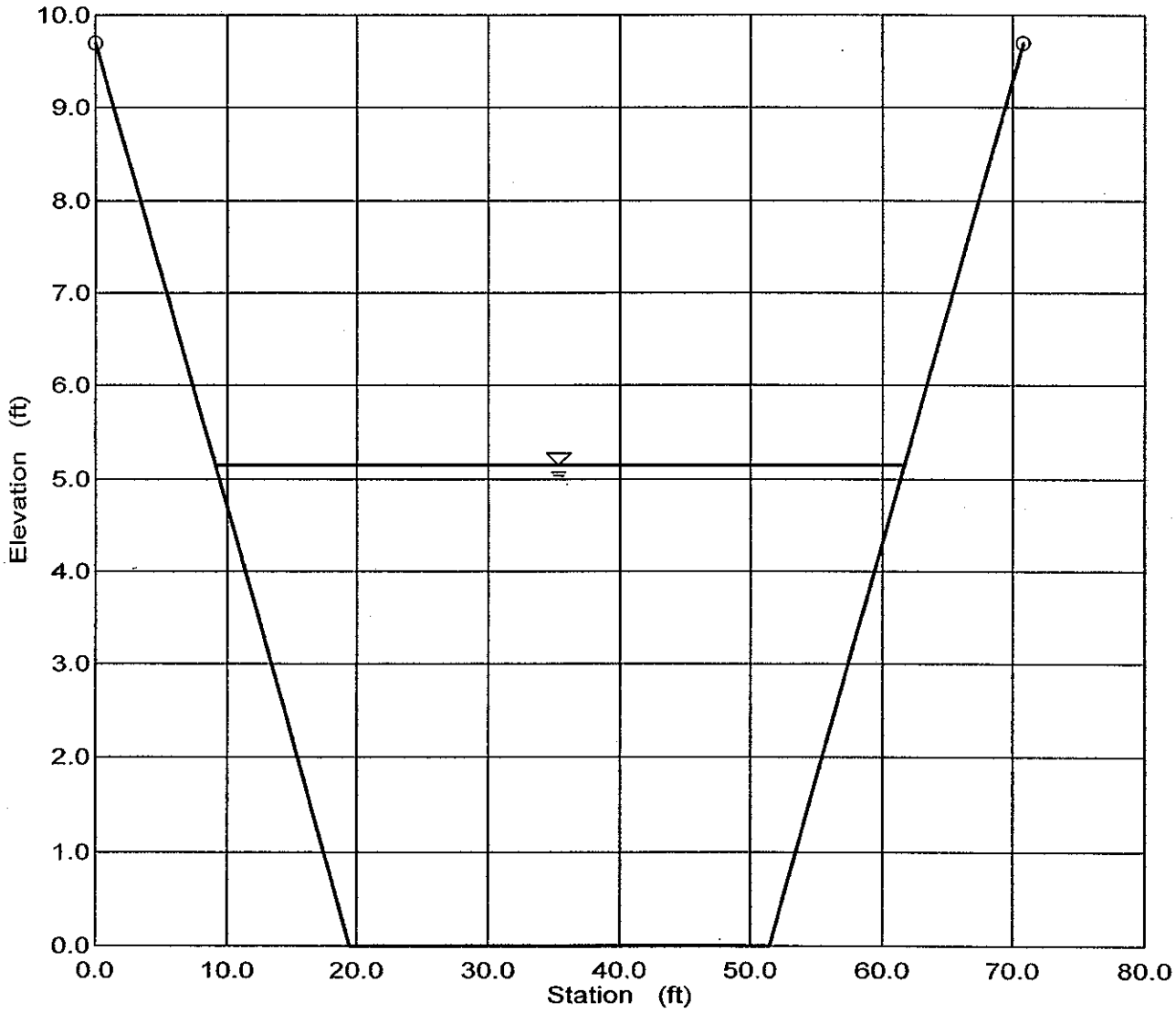
Wtd. Mannings Coefficient	0.025	
Water Surface Elevation	5.14	ft
Flow Area	217.45	ft^2
Wetted Perimeter	55.00	ft
Top Width	52.57	ft
Depth	5.14	ft
Critical Water Elev.	4.16	ft
Critical Slope	0.006353	ft/ft
Velocity	8.14	ft/s
Velocity Head	1.03	ft
Specific Energy	6.17	ft
Froude Number	0.71	
Full Flow Capacity	5719.23	ft^3/s

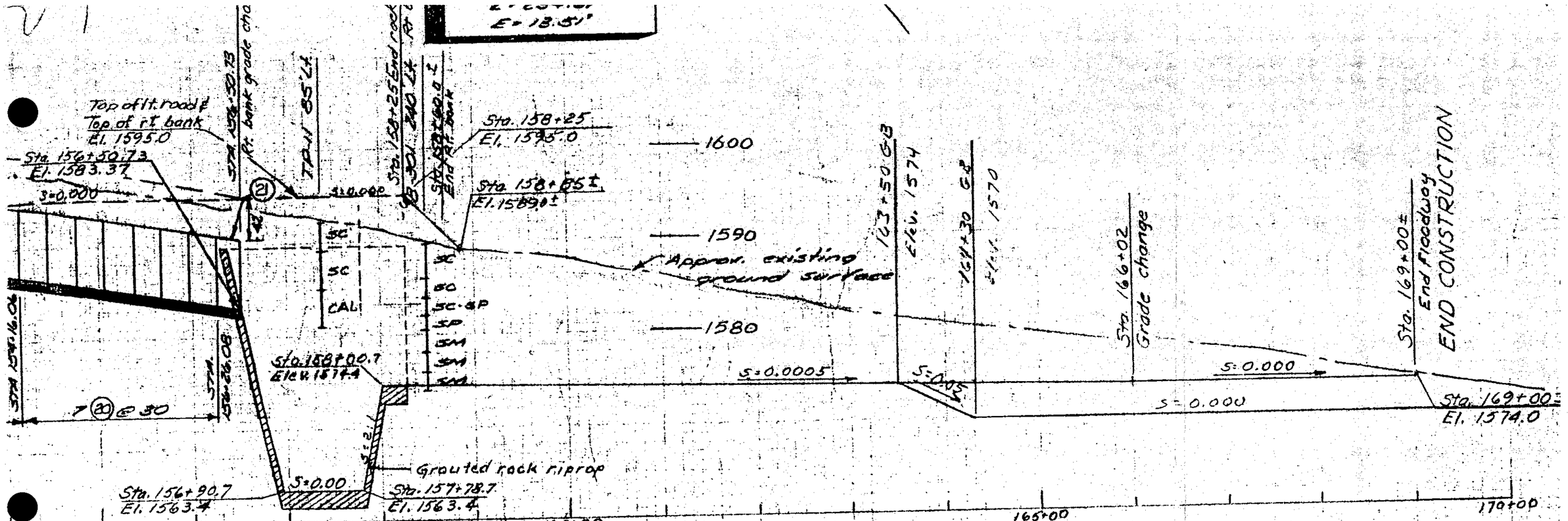
Flow is subcritical.

Signal Butte Floodway - Natural Channel
Cross Section for Irregular Channel

Project Description	
Project File	p:\instal~1\public~1\window~1\fmw\spookhil.fm2
Worksheet	Signal Butte Floodway
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

Section Data		
Wtd. Mannings Coefficient	0.025	
Channel Slope	0.003000	ft/ft
Water Surface Elevation	5.14	ft
Discharge	1770.00	ft^3/s





MAR

U. S.

Designed

Drawn

Traced

Checked

Signal Butte Floodway - Compound Channel
Worksheet for Irregular Channel

Project Description	
Project File	p:\instal~1\public~1\window~1\fmw\spookhil.fm2
Worksheet	Signal Butte Floodway - Compound Channel
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

Input Data

Channel Slope 0.015600 ft/ft

Elevation range: 0.00 ft to 12.50 ft.

Station (ft)	Elevation (ft)	Start Station	End Station	Roughness
0.00	12.50	0.00	24.00	0.025
10.00	7.50	24.00	38.00	0.016
24.00	7.50	38.00	48.00	0.025
24.00	0.00			
38.00	0.00			
38.00	7.50			
48.00	12.50			

Discharge 2532.00 ft^3/s

Results

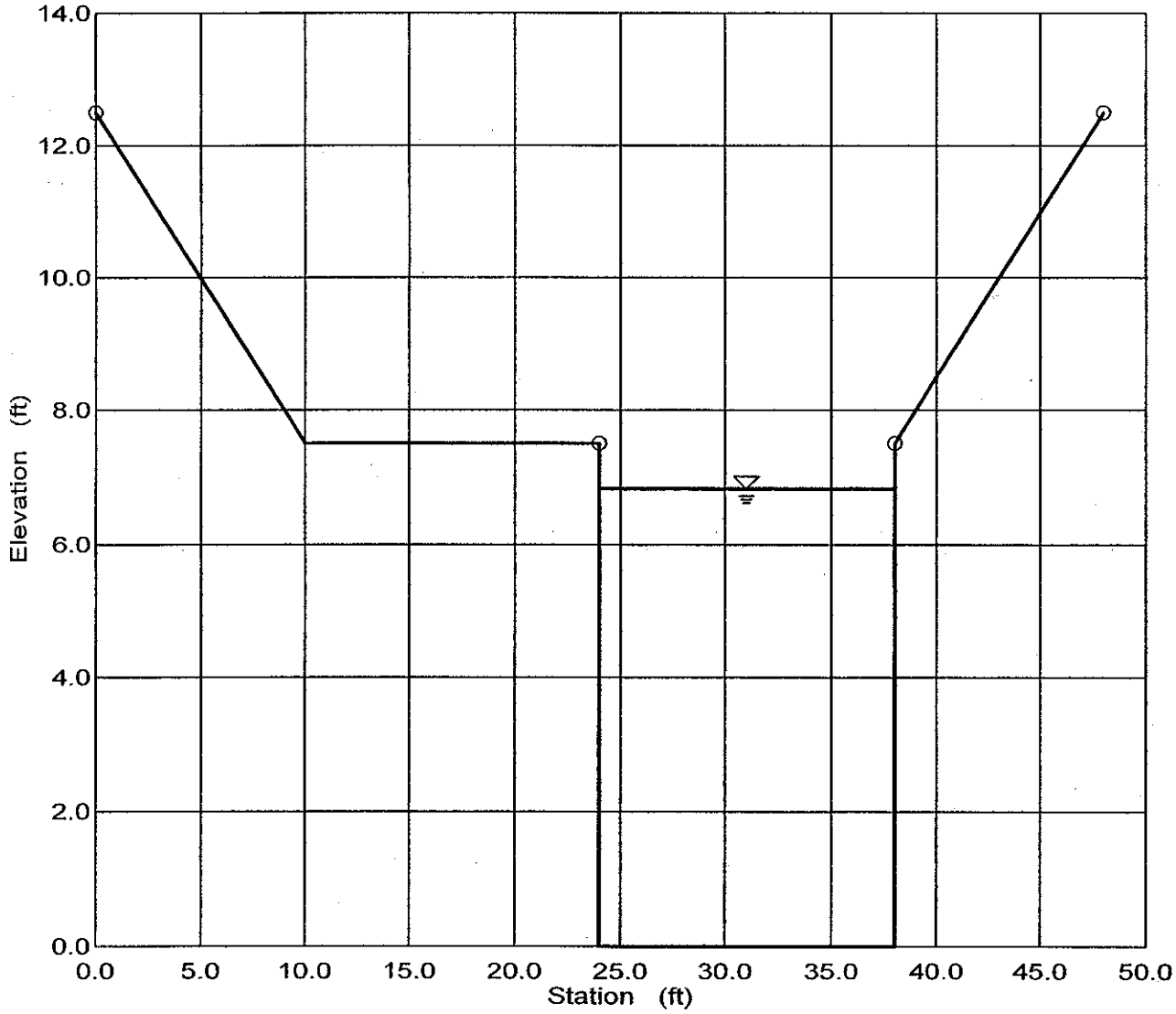
Wtd. Mannings Coefficient	0.016	
Water Surface Elevation	6.82	ft
Flow Area	95.51	ft^2
Wetted Perimeter	27.64	ft
Top Width	14.00	ft
Depth	6.82	ft
Critical Water Elev.	10.28	ft
Critical Slope	0.003274	ft/ft
Velocity	26.51	ft/s
Velocity Head	10.92	ft
Specific Energy	17.74	ft
Froude Number	1.79	
Full Flow Capacity	8754.77	ft^3/s

Flow is supercritical.

Signal Butte Floodway - Compound Channel
Cross Section for Irregular Channel

Project Description	
Project File	p:\instal~1\public~1\window~1\fmw\spookhil.fm2
Worksheet	Signal Butte Floodway - Compound Channel
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

Section Data		
Wtd. Mannings Coefficient	0.016	
Channel Slope	0.015600	ft/ft
Water Surface Elevation	6.82	ft
Discharge	2532.00	ft^3/s



Signal Butte Floodway - Concrete Channel
Worksheet for Rectangular Channel

Project Description	
Project File	p:\instal~1\public~1\window~1\fmw\spookhil.fm2
Worksheet	Signal Butte Floodway - Concrete Channel
Flow Element	Rectangular Channel
Method	Manning's Formula
Solve For	Channel Depth

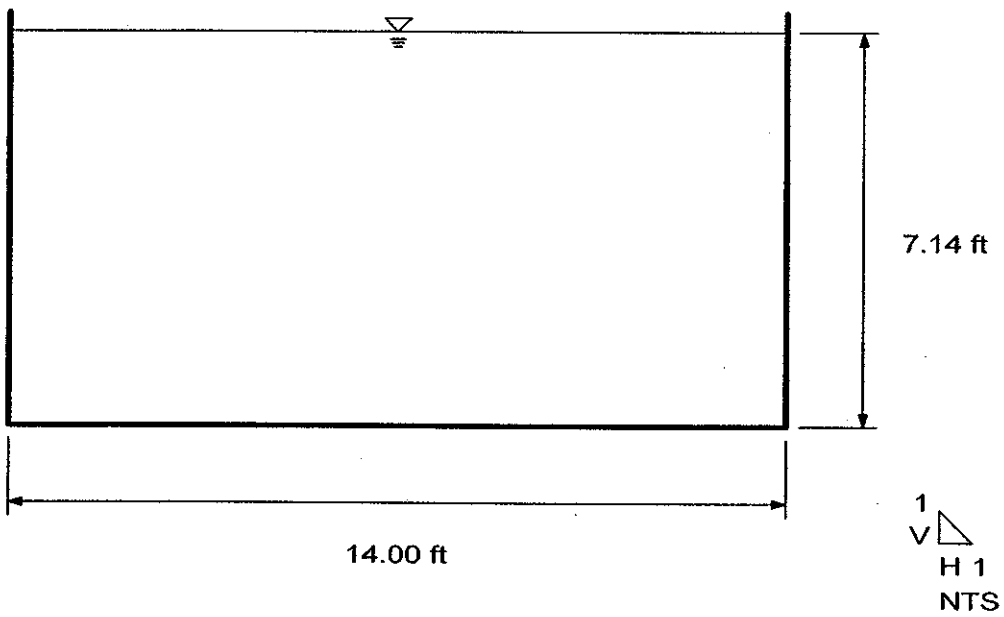
Input Data		
Mannings Coefficient	0.017	
Channel Slope	0.015600	ft/ft
Bottom Width	14.00	ft
Discharge	2532.00	ft^3/s

Results		
Depth	7.14	ft
Flow Area	99.95	ft^2
Wetted Perimeter	28.28	ft
Top Width	14.00	ft
Critical Depth	10.06	ft
Critical Slope	0.006397	ft/ft
Velocity	25.33	ft/s
Velocity Head	9.97	ft
Specific Energy	17.11	ft
Froude Number	1.67	
Flow is supercritical.		

Signal Butte Floodway - Concrete Channel
Cross Section for Rectangular Channel

Project Description	
Project File	p:\instal~1\public~1\window~1\fmw\spookhil.fm2
Worksheet	Signal Butte Floodway - Concrete Channel
Flow Element	Rectangular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.017	
Channel Slope	0.015600	ft/ft
Depth	7.14	ft
Bottom Width	14.00	ft
Discharge	2532.00	ft^3/s



SPOOK HILL ADMP
HEC-RAS FOR THE EXISTING CONDITIONS
OF THE SPOOK HILL FLOODWAY
USING THE 100-YEAR, 24-HOUR STORM

This hydraulic model was developed using the existing As-Built plans for the Spook Hill Floodway.

File: W:\1999Projects\99989-Spook Hill ADMP Update\Hydraulics\HEC-RAS\SPKFLDWY.PRJ

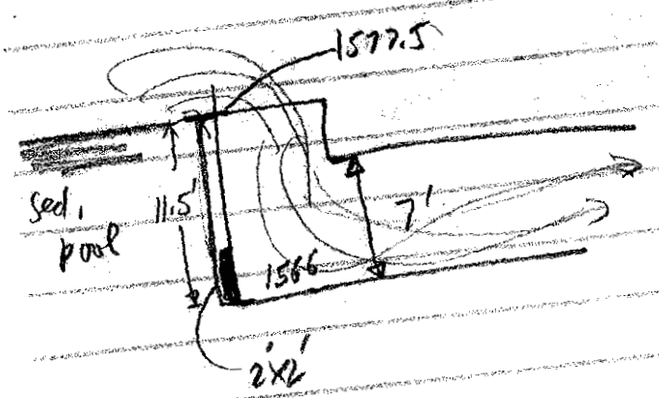
Spookhill floodway @ Principal spillway

1 – As-built capacity 29w cfs

2 – conc. line + sideslope 4w cfs
(Thomas Bridge may need to be modified)

3 – Q100 = 25w cfs ±

4 – cap. of prin. spill @ eme. crest elev = 1243 cfs.

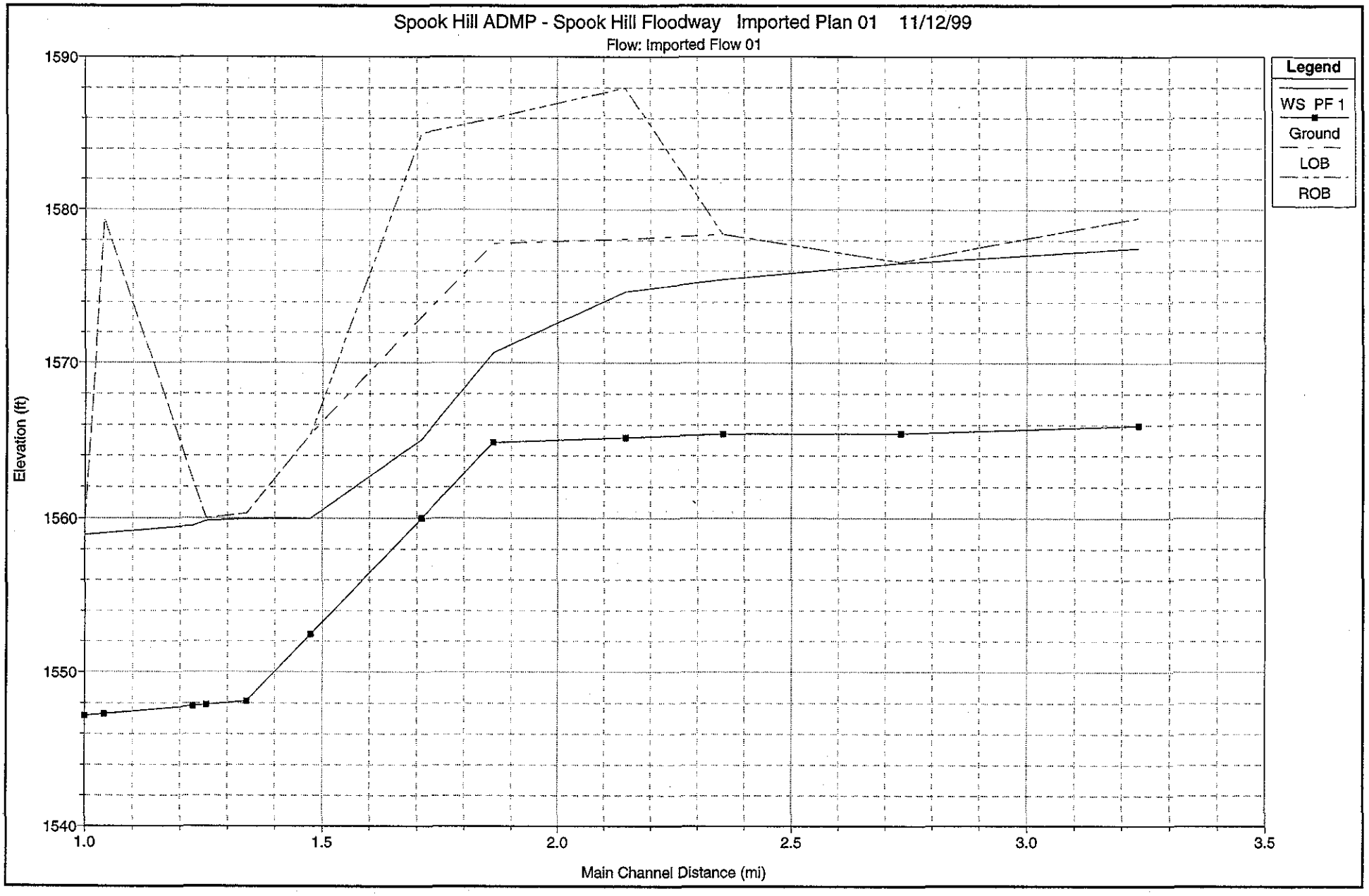


HEC-RAS Plan: Imported Pla River: RIVER-1 Reach: Reach-1

Reach	River Sta	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl	
		(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)		
Reach-1	12	2900.00	1565.96	1577.53	1571.72	1577.88	0.000331	4.71	615.11	76.32	0.29	←①
Reach-1	11	2900.00	1565.43	1576.53		1576.92	0.000390	5.01	579.20	74.33	0.32	
Reach-1	10	2900.00	1565.39	1575.47		1575.98	0.000568	5.74	505.14	70.27	0.38	
Reach-1	9	2900.00	1565.17	1574.67		1575.27	0.000711	6.22	466.05	68.12	0.42	
Reach-1	8	2900.00	1564.87	1570.64	1570.64	1572.91	0.004582	12.08	240.03	53.16	1.00	
Reach-1	7	2900.00	1560.00	1565.06	1565.78	1568.23	0.007375	14.27	203.19	50.25	1.25	
Reach-1	6	2900.00	1552.45	1559.99	1558.21	1561.12	0.001709	8.52	340.32	60.27	0.63	
Reach-1	5	2900.00	1548.13	1559.96		1560.29	0.000303	4.57	634.69	77.26	0.28	
Reach-1	4	2900.00	1547.89	1559.84		1560.15	0.000292	4.51	643.49	77.74	0.28	
Reach-1	3	2900.00	1547.81	1559.52		1560.07	0.000504	5.93	488.74	53.44	0.35	
Reach-1	2	2900.00	1547.29	1559.03		1559.57	0.000501	5.92	489.89	53.47	0.34	
Reach-1	1	2900.00	1547.18	1558.92	1553.32	1559.47	0.000500	5.92	489.95	53.45	0.34	←②

① d/s end of Sparkhill FRS Principal outlet/
(beginning of Sparkhill Floodway)

② d/s end of Sparkhill floodway


Spook Hill ADMP - Spook Hill Floodway Imported Plan 01 11/12/99
Flow: Imported Flow 01
Elevation (ft)
1590
1580
1570
1560
1550
1540
1.0
1.5
2.0
2.5
3.0
3.5
Main Channel Distance (mi)
Legend
WS PF 1
Ground
LOB
ROB

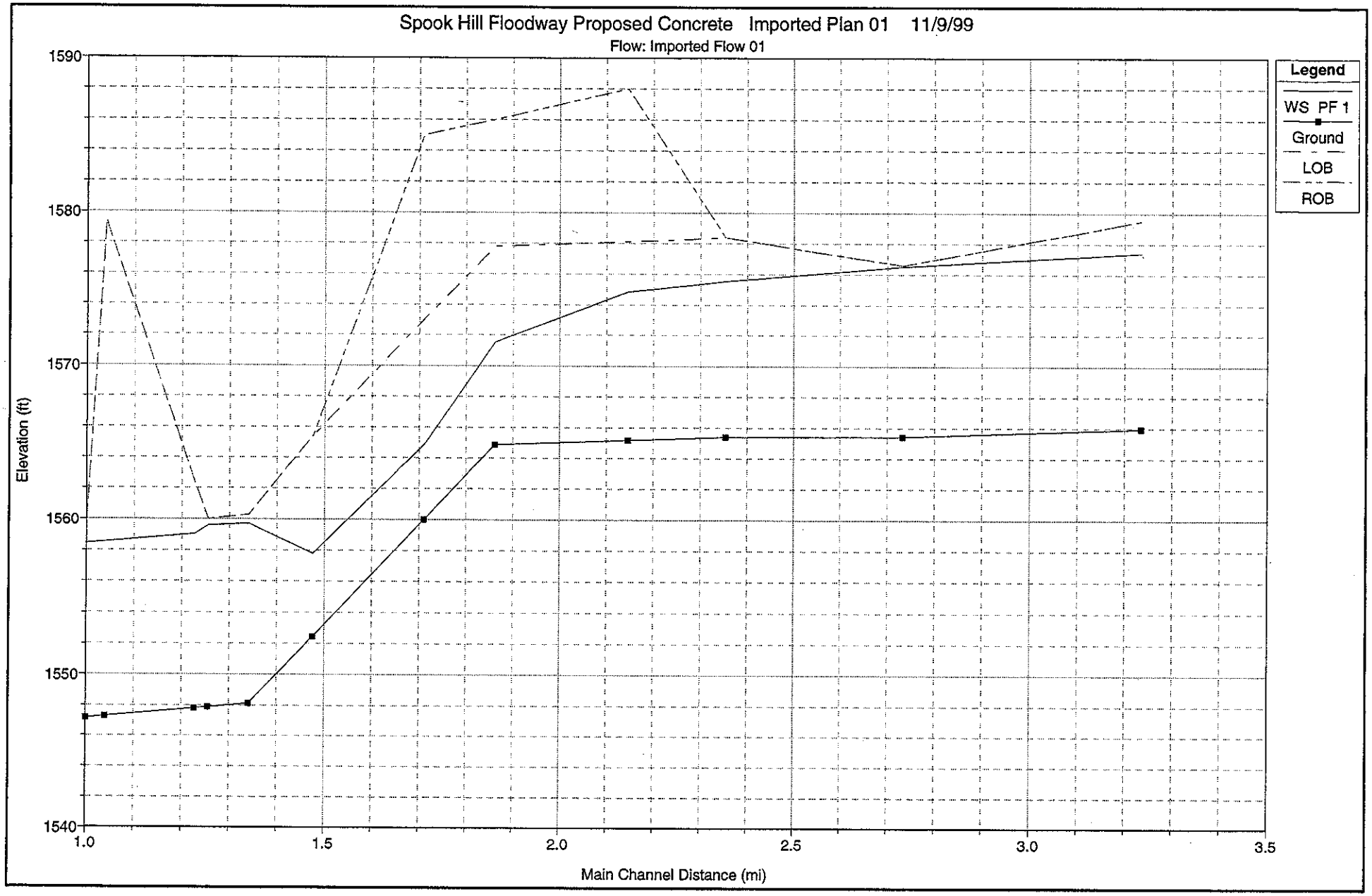
SPOOK HILL ADMP
HEC-RAS FOR THE PROPOSED CONDITIONS
OF THE SPOOK HILL FLOODWAY
USING THE 100-YEAR, 24-HOUR STORM

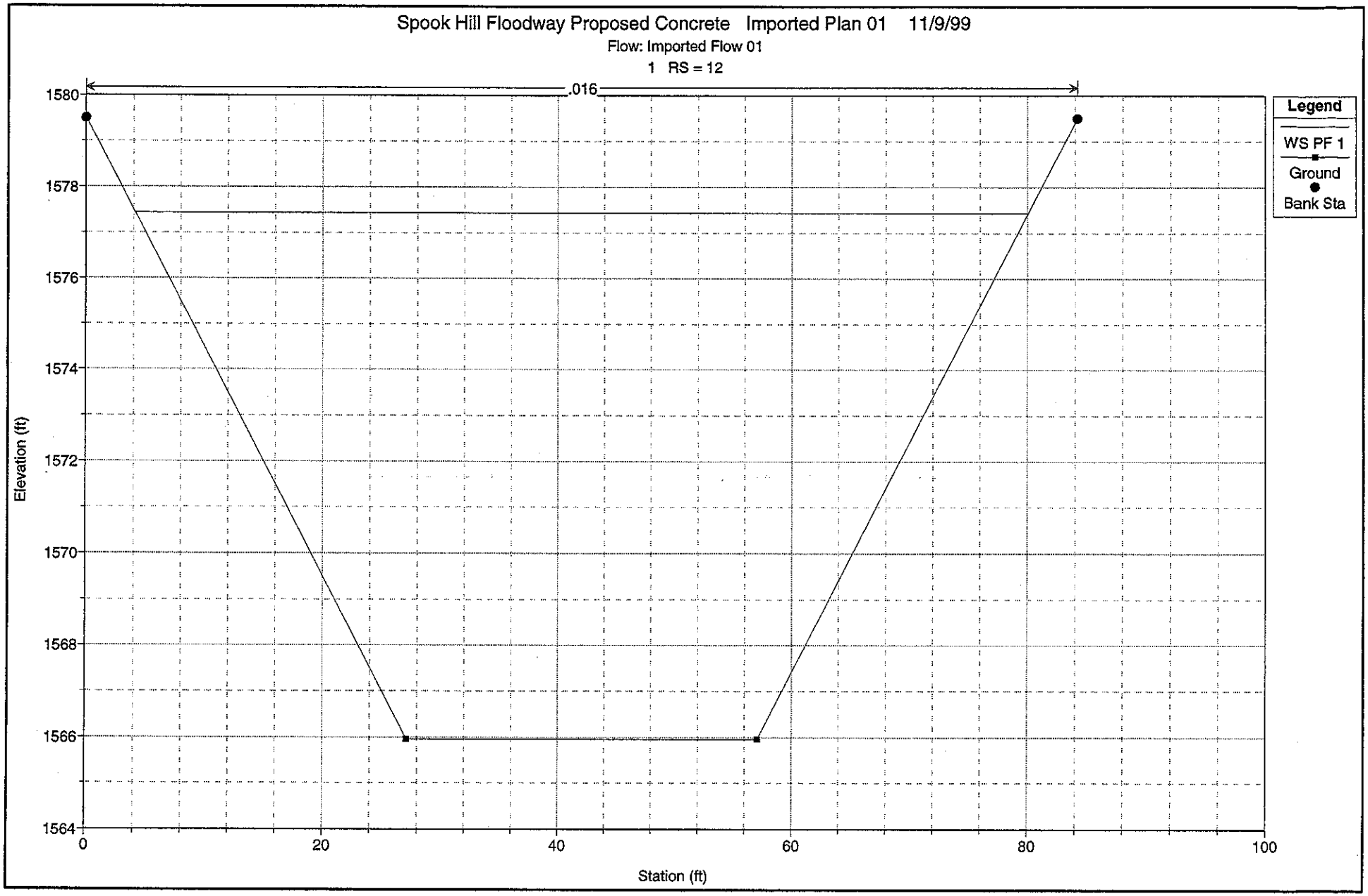
This hydraulic model was developed using the existing As-Built plans for the Spook Hill Floodway. In addition, the channel was analyzed as a concrete lined channel. Thus all Manning 'n' coefficients were reduced to 0.16.
.06

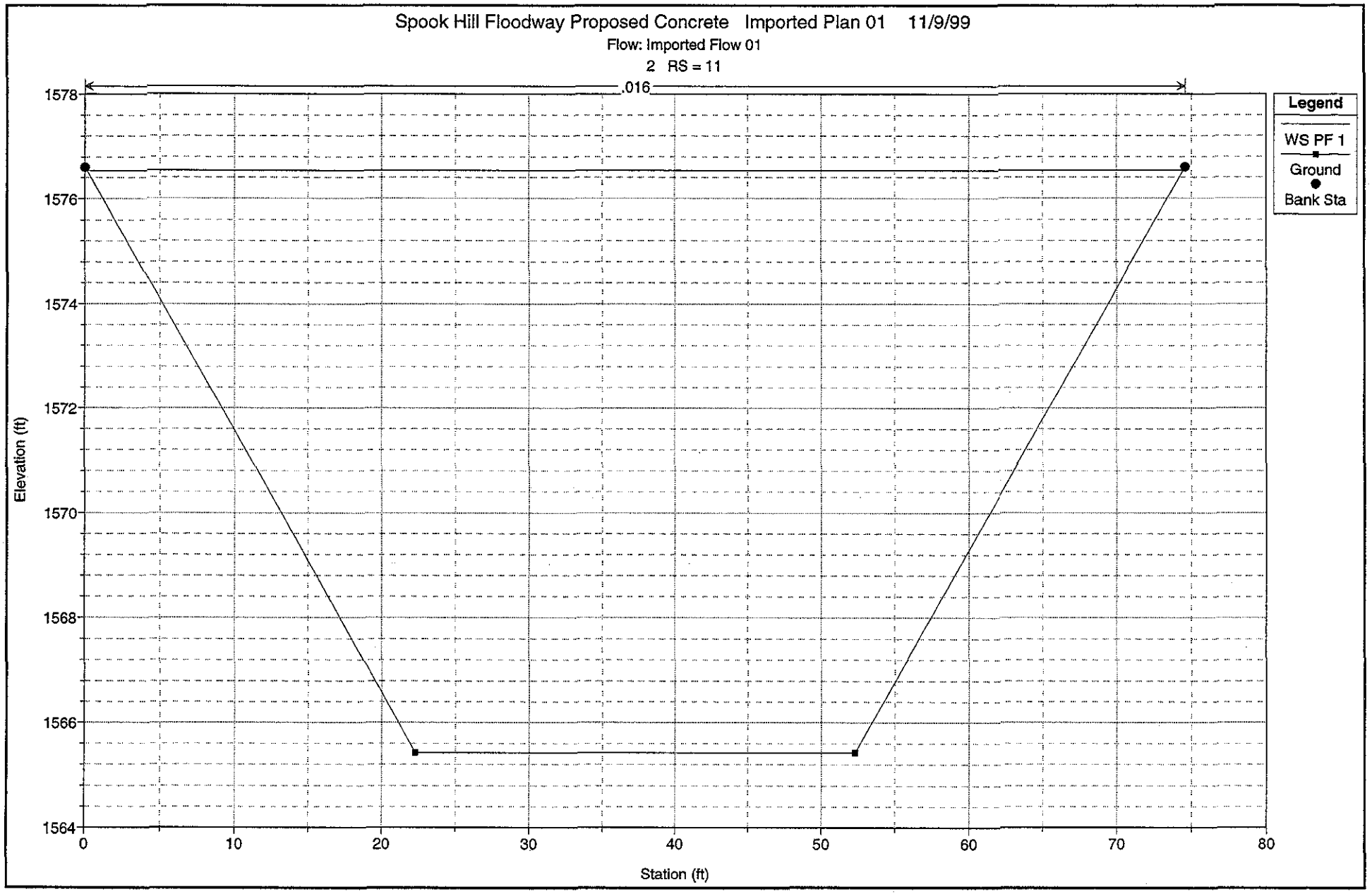
File: W:\1999Projects\99989-Spook Hill ADMP Update\Hydraulics\HEC-RAS\SPFLWYFU.PRJ

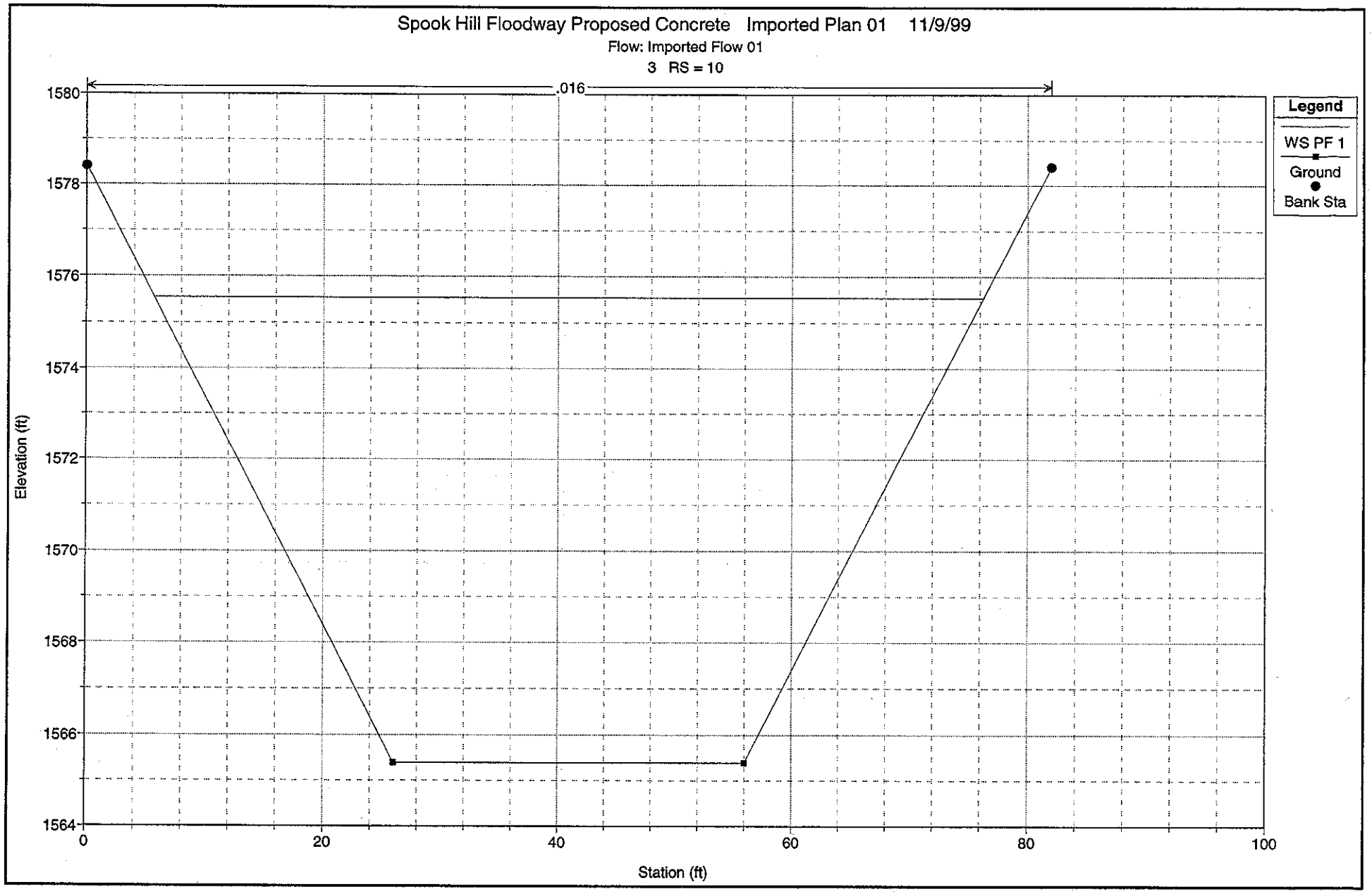
HEC-RAS Plan: Imported Pla River: RIVER-1 Reach: Reach-1

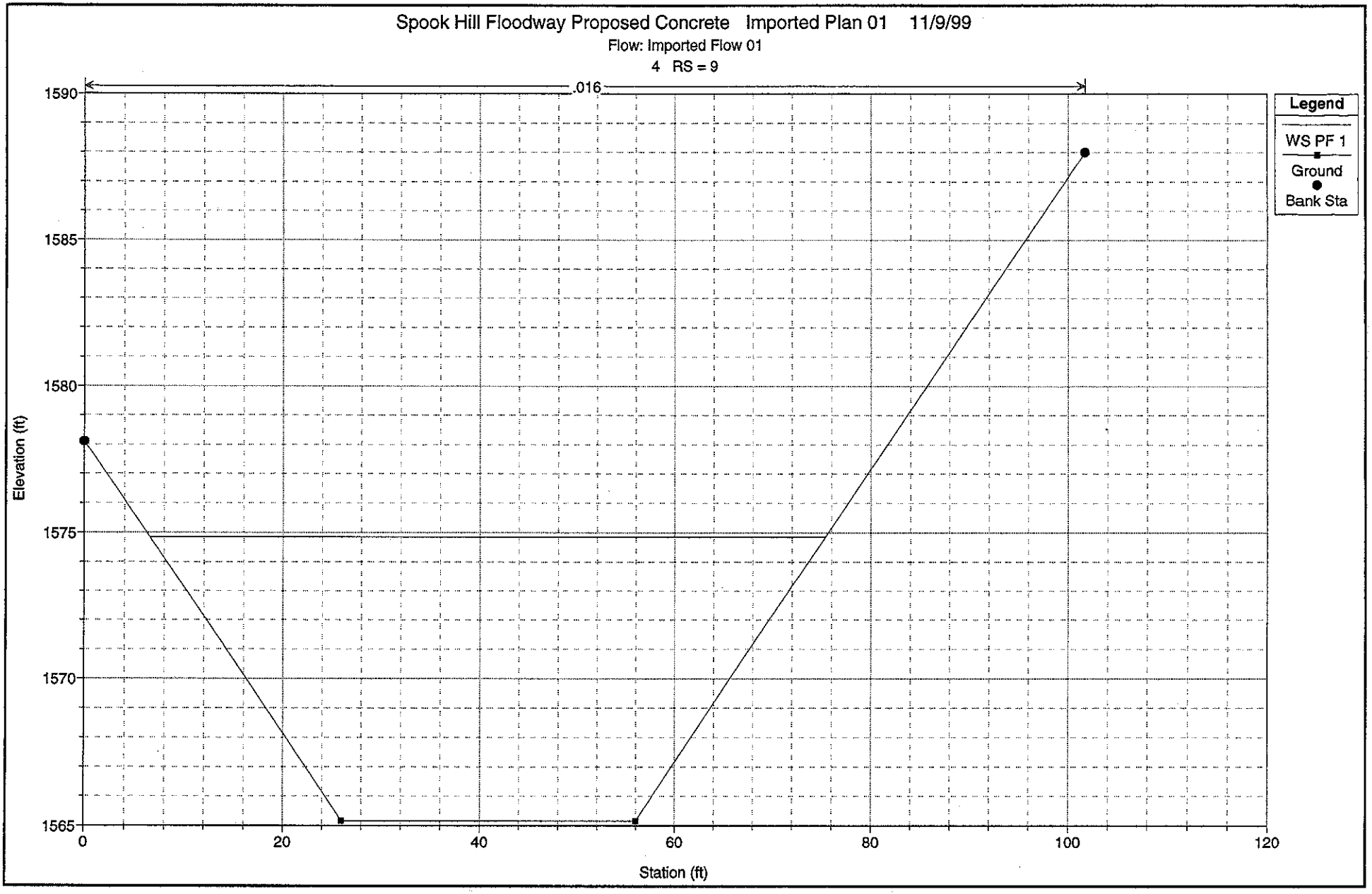
Reach	River Sta	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Reach-1	12	3700.00	1565.96	1577.43	1572.60	1578.01	0.000294	6.09	607.56	75.92	0.38
Reach-1	11	3700.00	1565.43	1576.54		1577.17	0.000335	6.38	579.55	74.35	0.40
Reach-1	10	3700.00	1565.39	1575.55		1576.36	0.000474	7.24	510.84	70.59	0.47
Reach-1	9	3700.00	1565.17	1574.85		1575.78	0.000570	7.73	478.37	68.84	0.52
Reach-1	8	3700.00	1564.87	1571.51	1571.51	1574.08	0.002356	12.85	287.88	56.66	1.00
Reach-1	7	3700.00	1560.00	1564.82	1566.64	1570.64	0.007576	19.36	191.12	49.28	1.73
Reach-1	6	3700.00	1552.45	1557.80	1559.11	1562.27	0.005191	16.97	218.08	51.49	1.45
Reach-1	5	3700.00	1548.13	1559.70	1554.78	1560.26	0.000285	6.02	614.52	76.21	0.37
Reach-1	4	3700.00	1547.89	1559.58		1560.13	0.000273	5.93	624.14	76.74	0.37
Reach-1	3	3700.00	1547.81	1559.04		1560.03	0.000504	7.99	463.09	52.47	0.47
Reach-1	2	3700.00	1547.29	1558.54		1559.53	0.000501	7.97	464.25	52.50	0.47
Reach-1	1	3700.00	1547.18	1558.44	1554.34	1559.42	0.000501	7.97	464.30	52.48	0.47

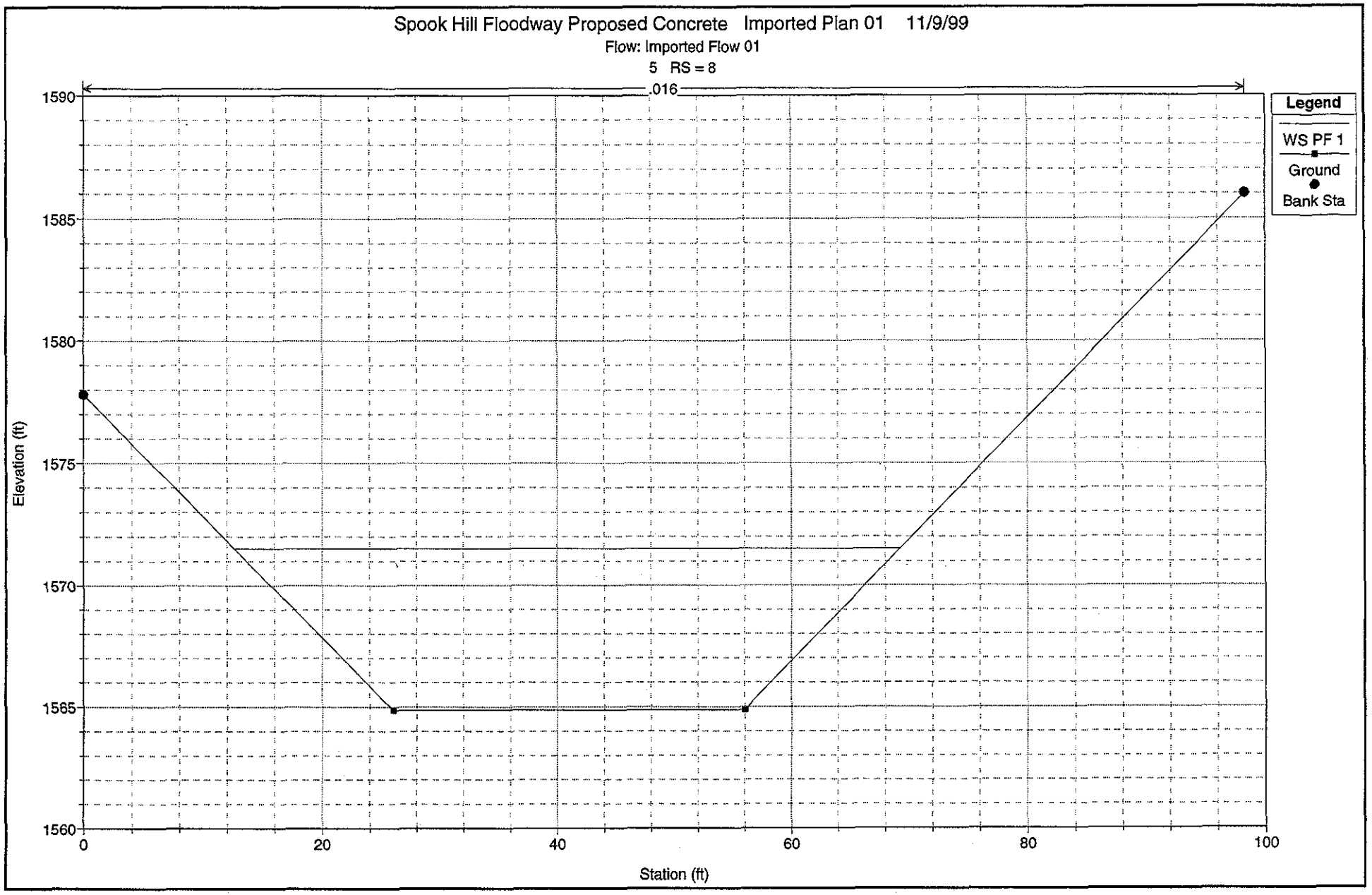

Spook Hill Floodway Proposed Concrete Imported Plan 01 11/9/99
Flow: Imported Flow 01
Elevation (ft)
1590
1580
1570
1560
1550
1540
1.0
1.5
2.0
2.5
3.0
3.5
Main Channel Distance (mi)
Legend
WS PF 1
Ground
LOB
ROB


Spook Hill Floodway Proposed Concrete Imported Plan 01 11/9/99
Flow: Imported Flow 01
1 RS = 12
.016
Legend
WS PF 1
Ground
Bank Sta
Elevation (ft)
1580
1578
1576
1574
1572
1570
1568
1566
1564
0
20
40
60
80
100
Station (ft)

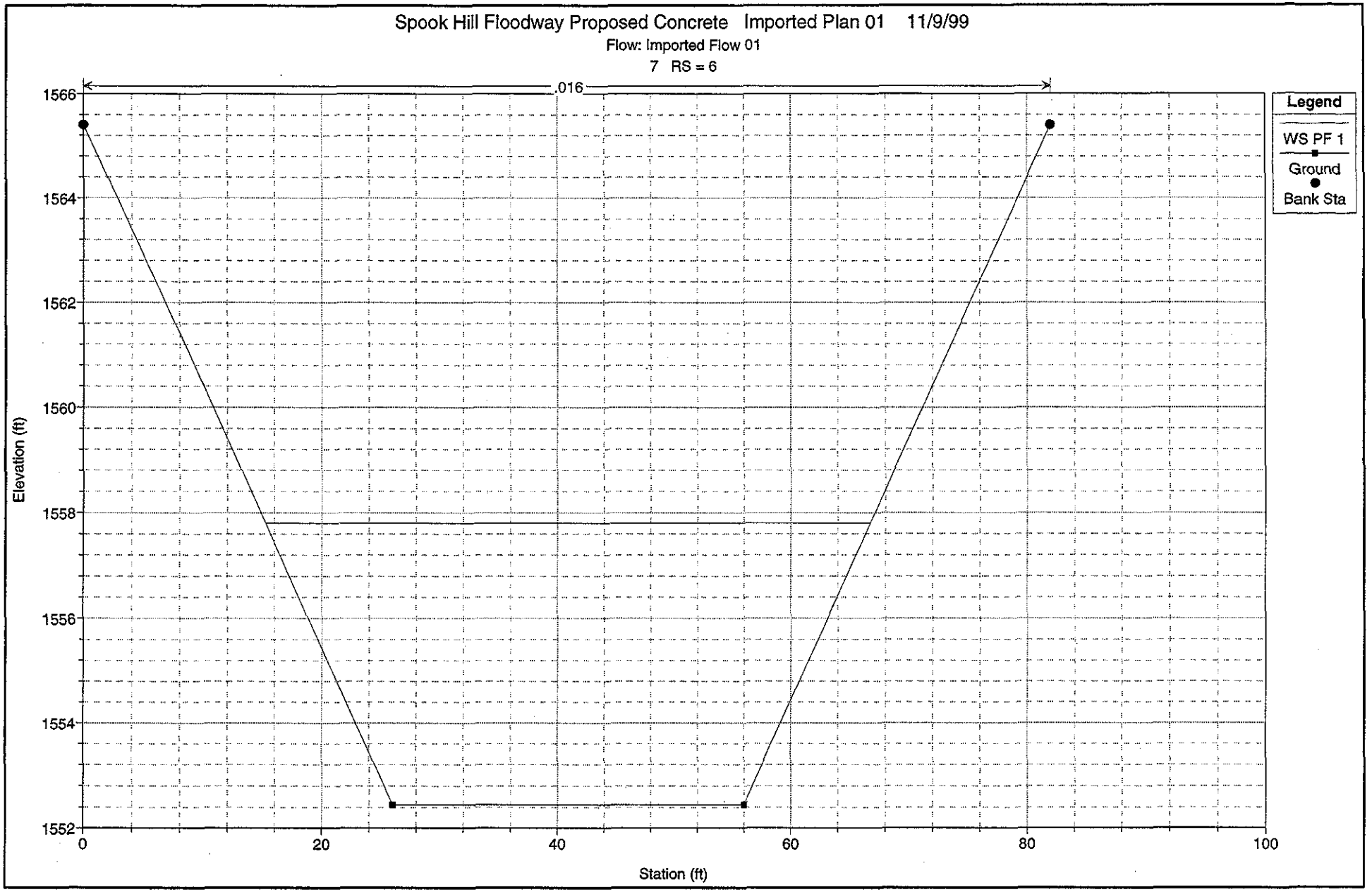

Spook Hill Floodway Proposed Concrete Imported Plan 01 11/9/99
Flow: Imported Flow 01
2 RS = 11
.016
Legend
WS PF 1
Ground
Bank Sta
Elevation (ft)
1578
1576
1574
1572
1570
1568
1566
1564
0
10
20
30
40
50
60
70
80
Station (ft)

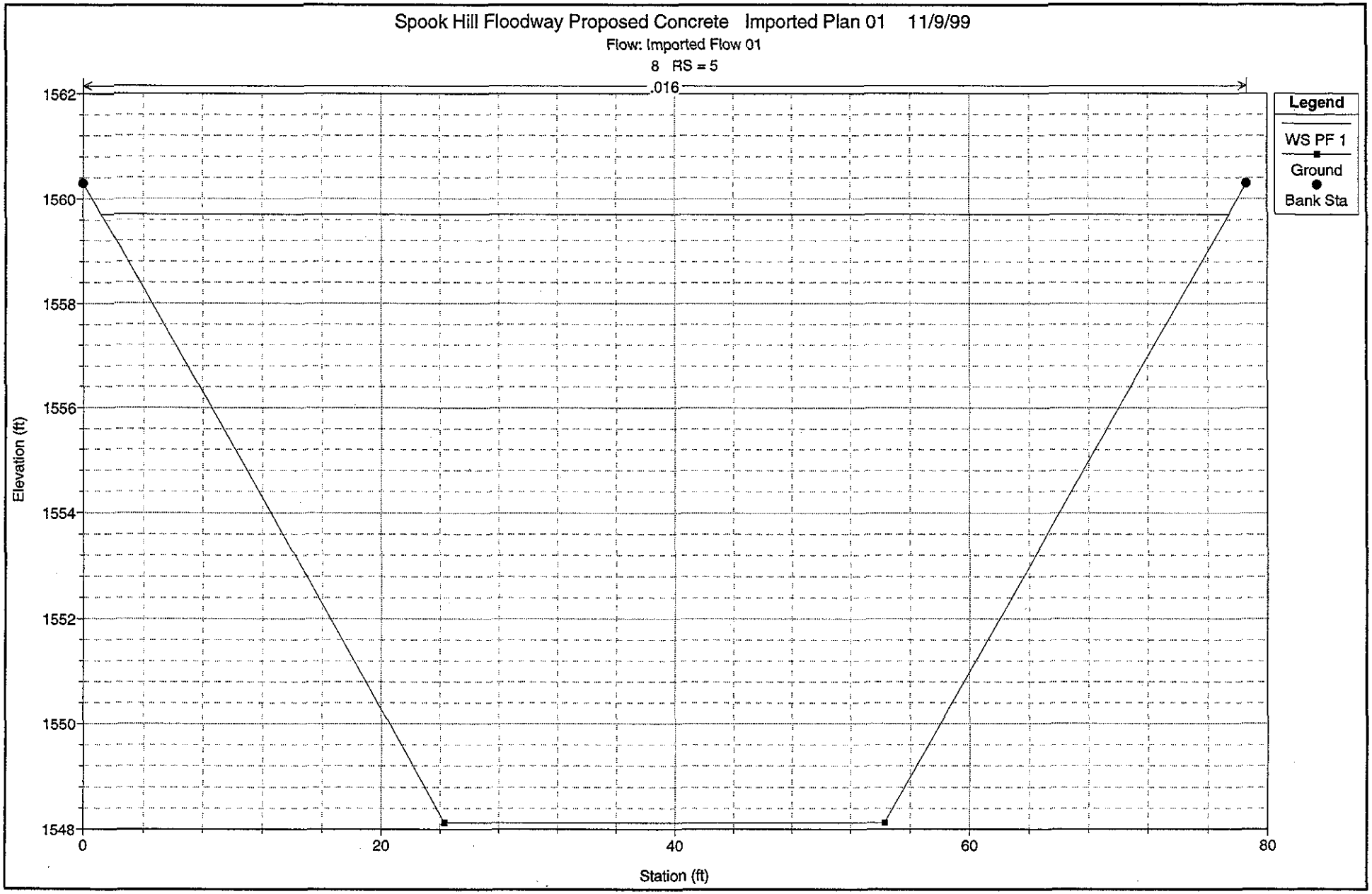

Spook Hill Floodway Proposed Concrete Imported Plan 01 11/9/99
Flow: Imported Flow 01
3 RS = 10
.016
Legend
WS PF 1
Ground
Bank Sta
Elevation (ft)
1580
1578
1576
1574
1572
1570
1568
1566
1564
0
20
40
60
80
100
Station (ft)

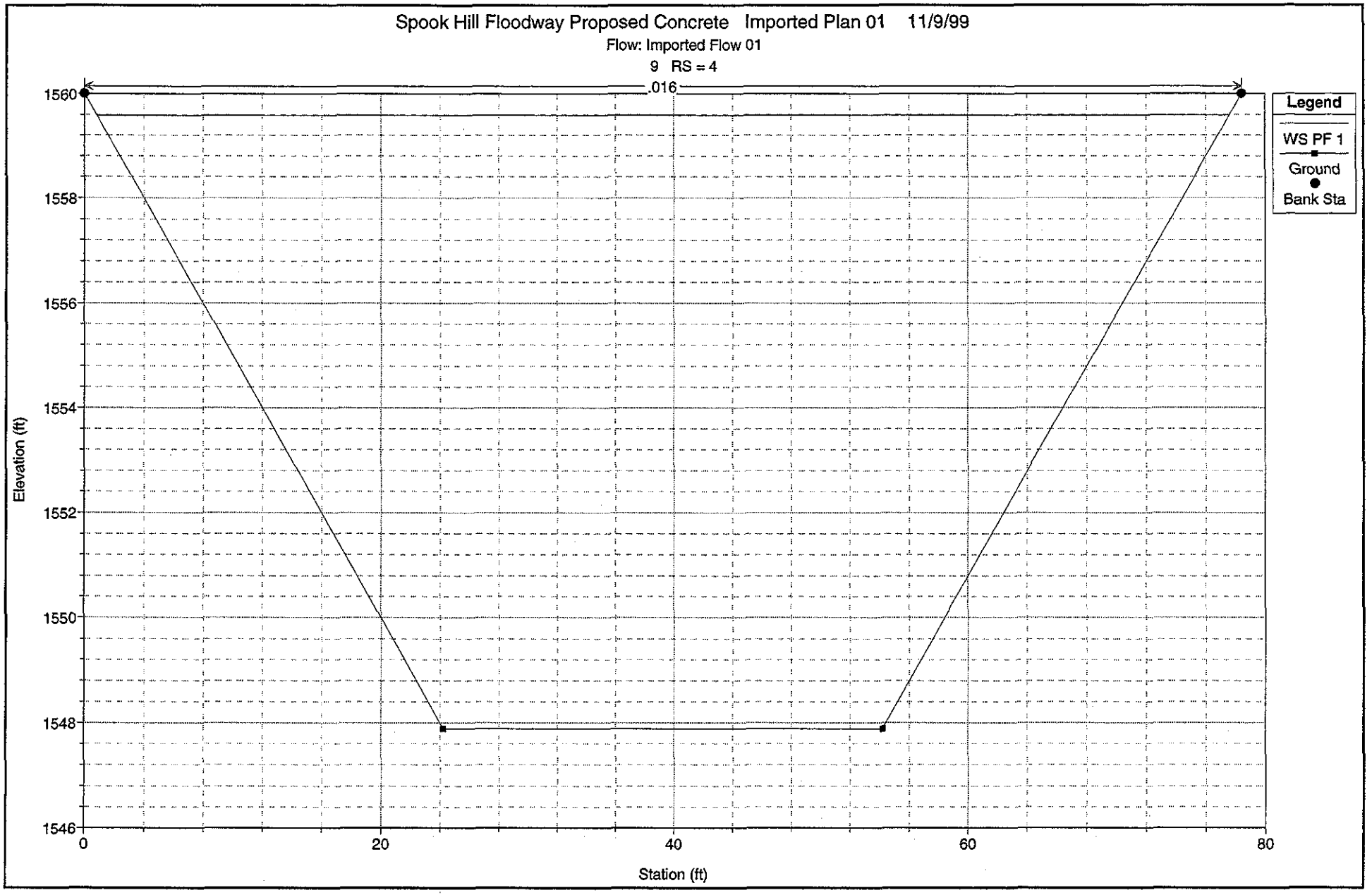

Spook Hill Floodway Proposed Concrete Imported Plan 01 11/9/99
Flow: Imported Flow 01
4 RS = 9
.016
Legend
WS PF 1
Ground
Bank Sta
Elevation (ft)
1590
1585
1580
1575
1570
1565
0
20
40
60
80
100
120
Station (ft)

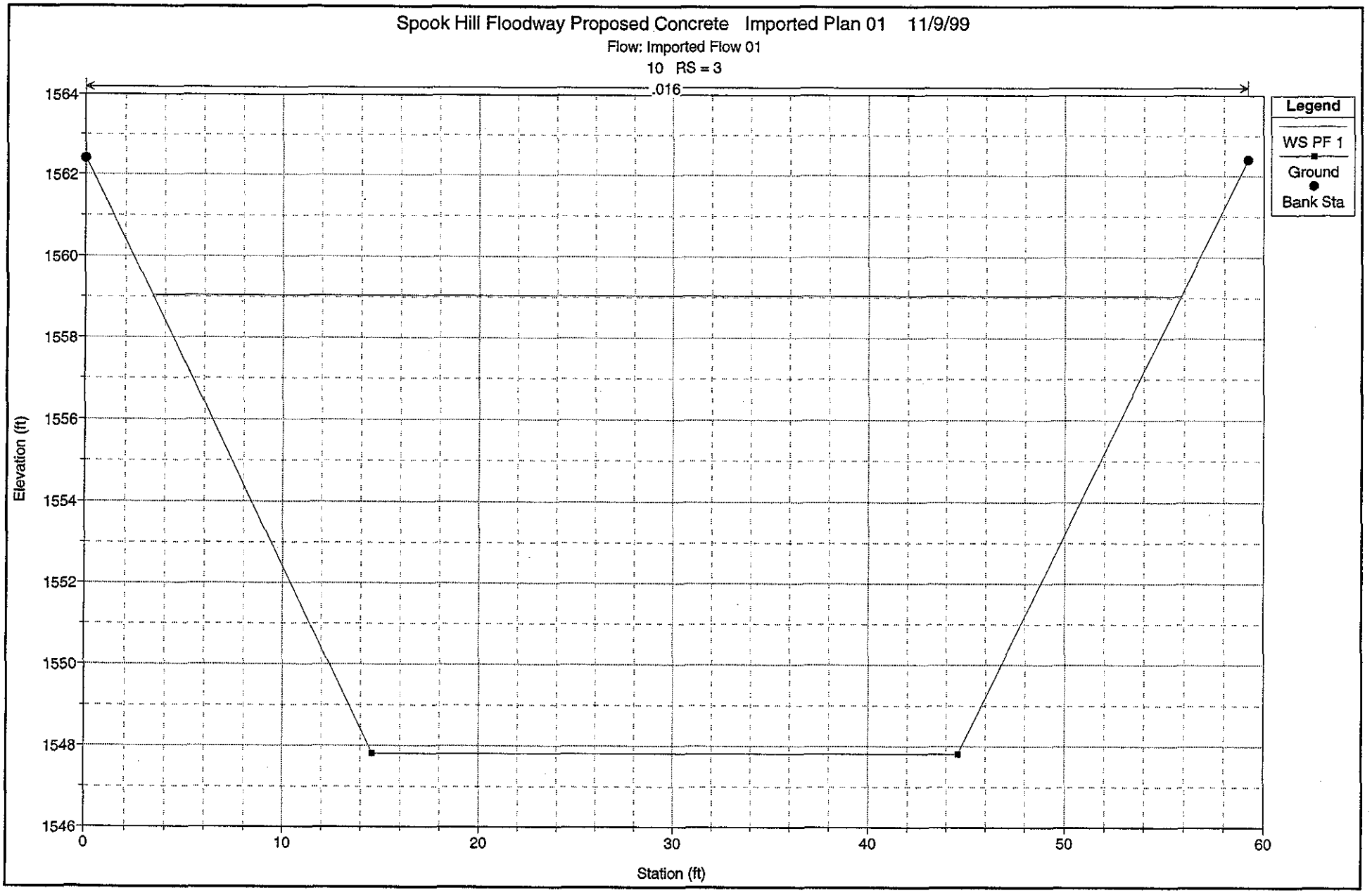

Spook Hill Floodway Proposed Concrete Imported Plan 01 11/9/99
Flow: Imported Flow 01
5 RS = 8
.016
Legend
WS PF 1
Ground
Bank Sta
Elevation (ft)
1590
1585
1580
1575
1570
1565
1560
0
20
40
60
80
100
Station (ft)

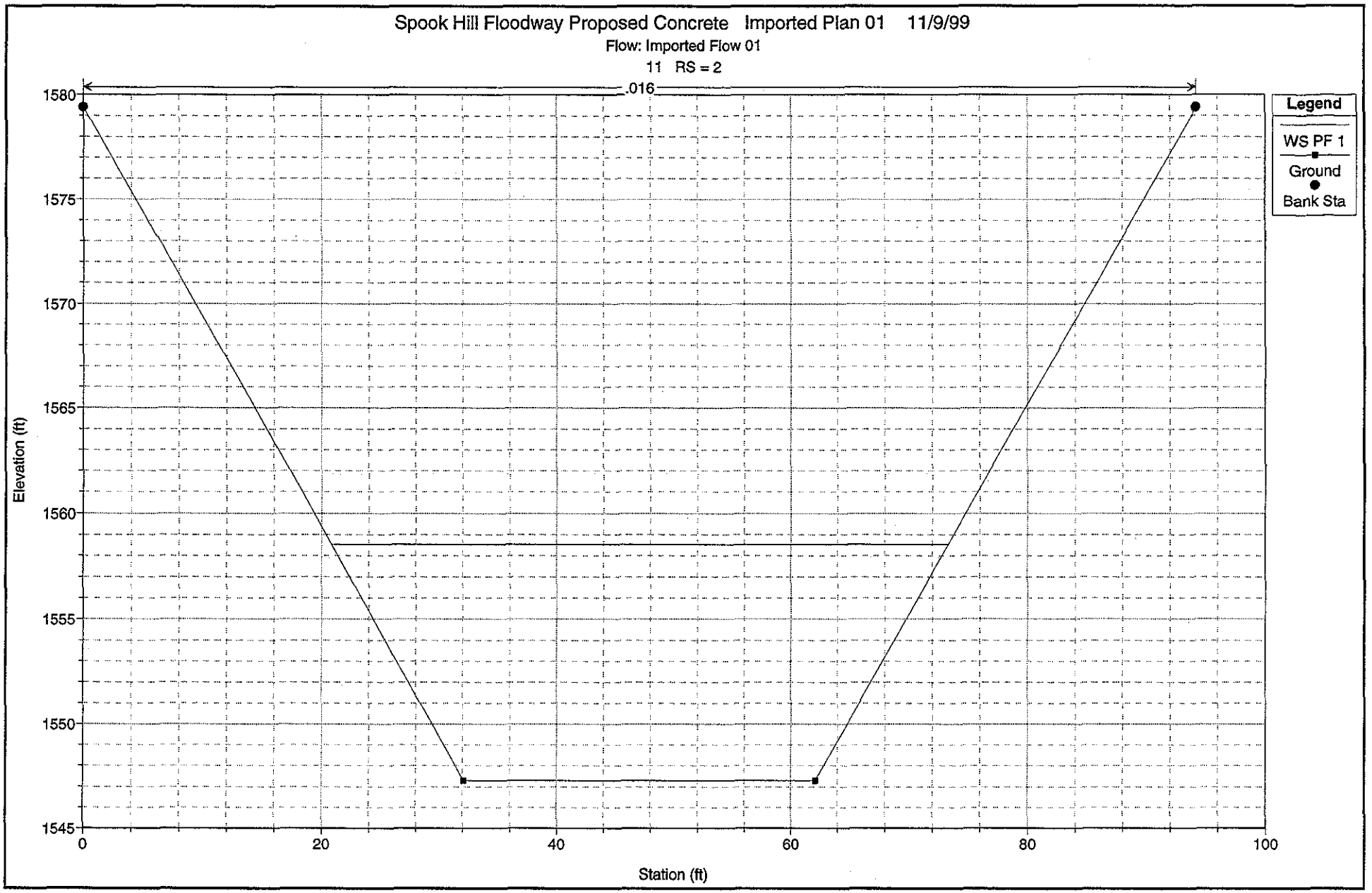
Spook Hill Floodway Proposed Concrete Imported Plan 01 11/9/99
Flow: Imported Flow 01
6 RS = 7
.016
Legend
WS PF 1
Ground
Bank Sta
Elevation (ft)
1585
1580
1575
1570
1565
1560
0
20
40
60
80
100
120
Station (ft)

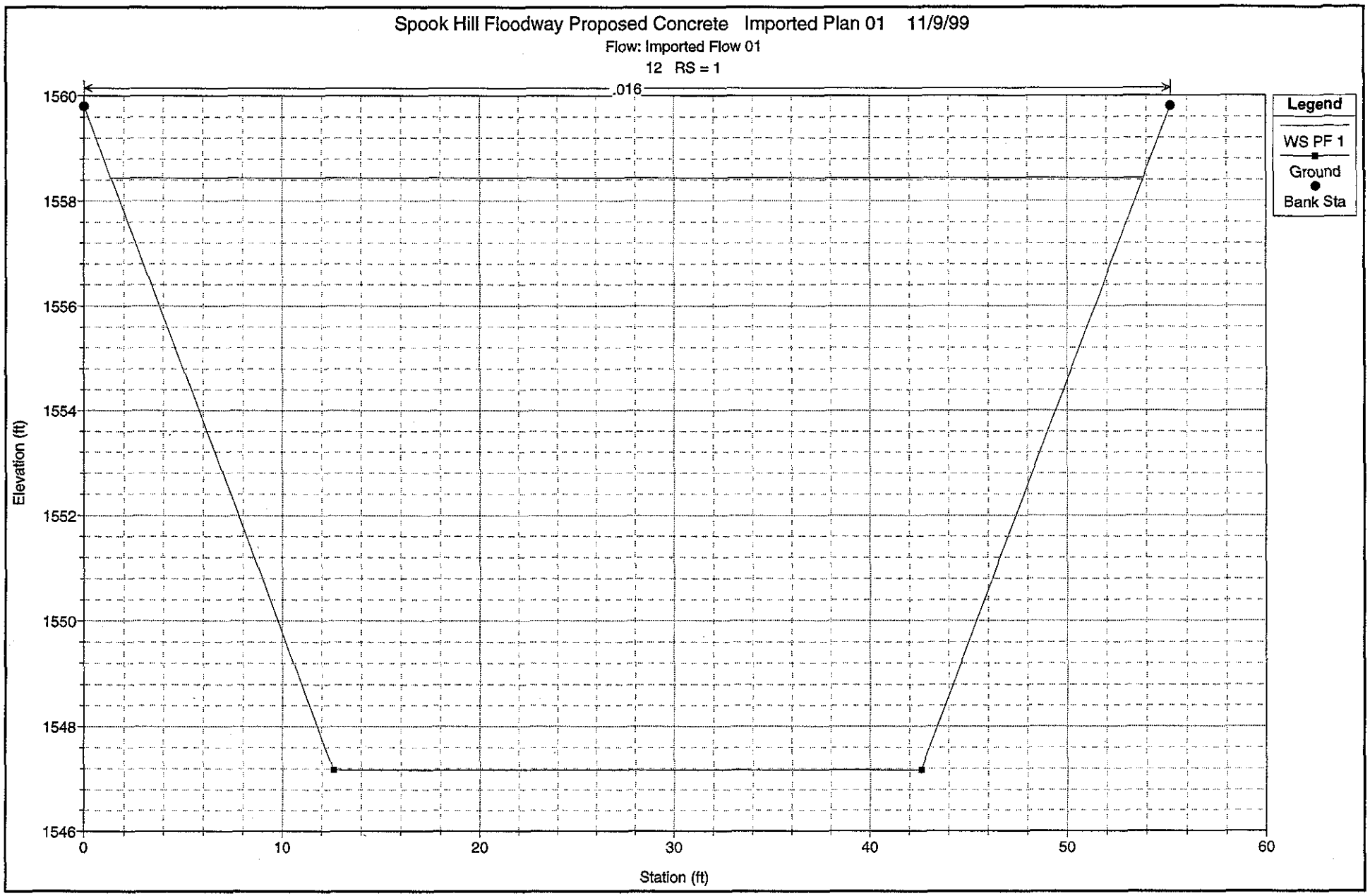

Spook Hill Floodway Proposed Concrete Imported Plan 01 11/9/99
Flow: Imported Flow 01
7 RS = 6
.016
Legend
WS PF 1
Ground
Bank Sta
Elevation (ft)
1566
1564
1562
1560
1558
1556
1554
1552
0
20
40
60
80
100
Station (ft)


Spook Hill Floodway Proposed Concrete Imported Plan 01 11/9/99
Flow: Imported Flow 01
8 RS = 5
.016
Legend
WS PF 1
Ground
Bank Sta
Elevation (ft)
1562
1560
1558
1556
1554
1552
1550
1548
0
20
40
60
80
Station (ft)


Spook Hill Floodway Proposed Concrete Imported Plan 01 11/9/99
Flow: Imported Flow 01
9 RS = 4
.016
Legend
WS PF 1
Ground
Bank Sta
Elevation (ft)
1560
1558
1556
1554
1552
1550
1548
1546
0
20
40
60
80
Station (ft)


Spook Hill Floodway Proposed Concrete Imported Plan 01 11/9/99
Flow: Imported Flow 01
10 RS = 3
.016
Legend
WS PF 1
Ground
Bank Sta
Elevation (ft)
1564
1562
1560
1558
1556
1554
1552
1550
1548
1546
0
10
20
30
40
50
60
Station (ft)


Spook Hill Floodway Proposed Concrete Imported Plan 01 11/9/99
Flow: Imported Flow 01
11 RS = 2
.016
Legend
WS PF 1
Ground
Bank Sta
Elevation (ft)
1580
1575
1570
1565
1560
1555
1550
1545
0
20
40
60
80
100
Station (ft)


Spook Hill Floodway Proposed Concrete Imported Plan 01 11/9/99
Flow: Imported Flow 01
12 RS = 1
.016
Legend
WS PF 1
Ground
Bank Sta
Elevation (ft)
1560
1558
1556
1554
1552
1550
1548
1546
0
10
20
30
40
50
60
Station (ft)

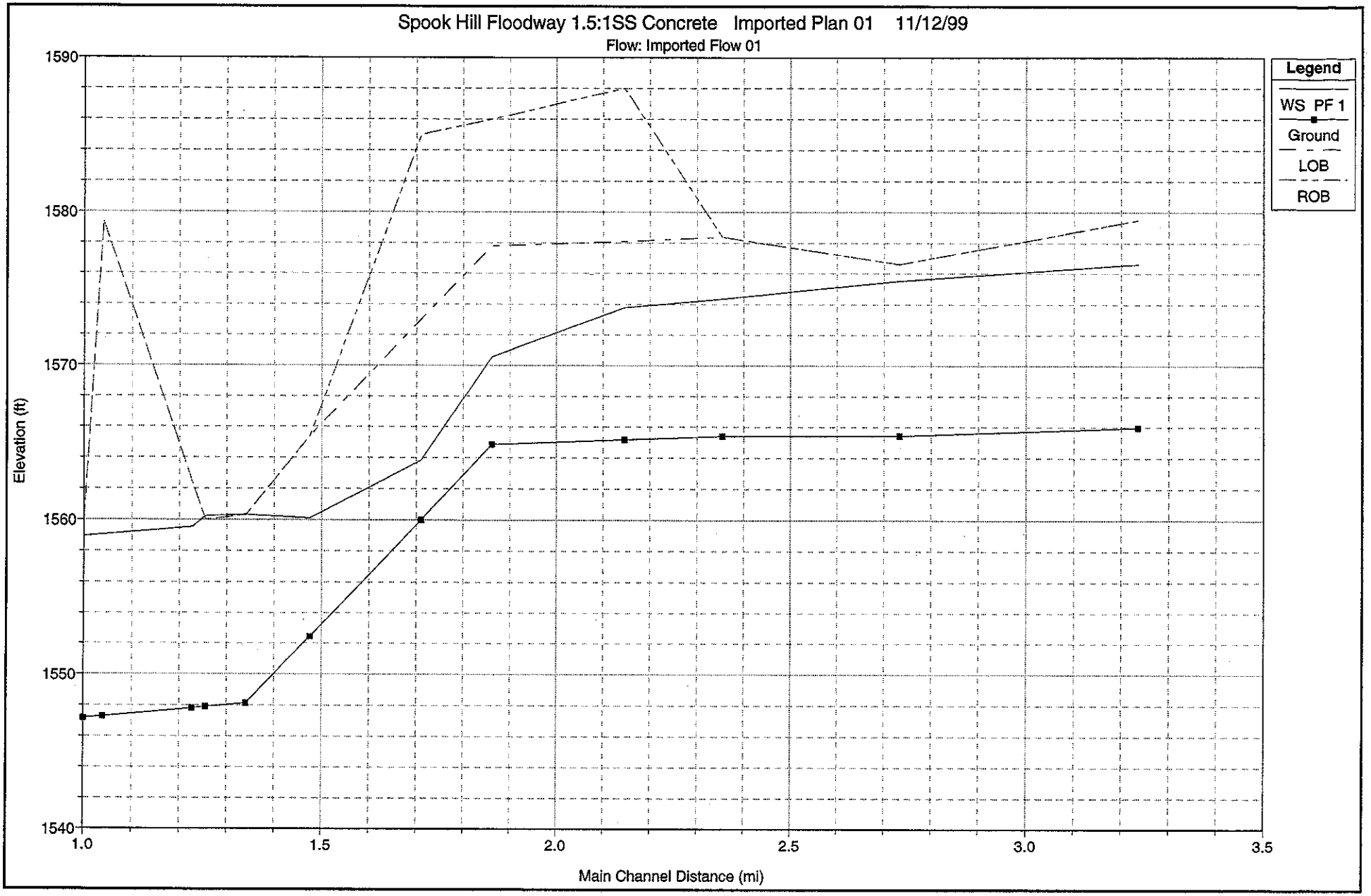
SPOOK HILL ADMP
HEC-RAS FOR THE PROPOSED CONDITIONS
OF THE SPOOK HILL FLOODWAY
USING THE 100-YEAR, 24-HOUR STORM

This hydraulic model was developed using the existing As-Built plans for the Spook Hill Floodway. In addition, the channel was analyzed as a concrete lined channel. Thus all Manning 'n' coefficients were reduced to 0.16. Finally, the channel side slopes were altered to 1.5:1 to determine the maximum discharge capable within the channel

File: W:\1999Projects\99989-Spook Hill ADMP Update\Hydraulics\HEC-RAS\SPFUSS.PRJ

HEC-RAS Plan: Imported Pla River: RIVER-1 Reach: Reach-1

Reach	River Sta	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
		(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach-1	12	4000.00	1565.96	1576.61	1571.91	1577.23	0.000301	6.30	634.67	75.55	0.38
Reach-1	11	4000.00	1565.43	1575.52		1576.30	0.000405	7.05	567.62	71.37	0.44
Reach-1	10	4000.00	1565.39	1574.35		1575.32	0.000573	7.91	505.38	69.85	0.52
Reach-1	9	4000.00	1565.17	1573.77		1574.67	0.000541	7.63	524.43	73.88	0.50
Reach-1	8	4000.00	1564.87	1570.56	1570.56	1573.03	0.002357	12.62	316.99	64.27	1.00
Reach-1	7	4000.00	1560.00	1563.84	1565.56	1569.47	0.008411	19.04	210.05	60.51	1.80
Reach-1	6	4000.00	1552.45	1560.11	1558.43	1561.52	0.000990	9.56	418.55	66.14	0.67
Reach-1	5	4000.00	1548.13	1560.32		1560.78	0.000196	5.44	735.19	78.60	0.31
Reach-1	4	4000.00	1547.89	1560.24		1560.68	0.000186	5.35	747.73	78.40	0.31
Reach-1	3	4000.00	1547.81	1559.55		1560.58	0.000504	8.17	489.86	53.49	0.48
Reach-1	2	4000.00	1547.29	1559.05		1560.08	0.000501	8.15	491.06	53.51	0.47
Reach-1	1	4000.00	1547.18	1558.94	1554.68	1559.97	0.000500	8.14	491.10	53.49	0.47


Spook Hill Floodway 1.5:1SS Concrete Imported Plan 01 11/12/99
Flow: Imported Flow 01
Legend
WS PF 1
Ground
LOB
ROB
Elevation (ft)
1590
1580
1570
1560
1550
1540
1.0
1.5
2.0
2.5
3.0
3.5
Main Channel Distance (mi)

SPOOK HILL ADMP
HYDRAIN HY8 OUTPUT
OF THE SPOOK HILL FLOODWAY
CULVERT CROSSING LOCATED AT E. THOMAS ROAD

This Hydrain HY8 hydraulic model was developed using the maximum discharge capable of being passed under the roadway with no overtopping of the road.

File: W:\1999Projects\99989-Spook Hill ADMP Update\Hydrain\SPOOK2.LST

CURRENT DATE: 11-12-1999 FILE DATE: 11-12-1999
CURRENT TIME: 07:30:43 FILE NAME: SPOOK2

FHWA CULVERT ANALYSIS
HY-8, VERSION 6.1

CULVERT NO.	INLET ELEV. (ft)	OUTLET ELEV. (ft)	CULVERT LENGTH (ft)	BARRELS SHAPE MATERIAL	SPAN (ft)	RISE (ft)	MANNING n	INLET TYPE
1	1.06	1.00	30.00	3 RCB	12.00	8.00	.012	CONVENTIONAL
2								
3								
4								
5								
6								

SUMMARY OF CULVERT FLOWS (cfs) FILE: SPOOK2 DATE: 11-12-1999

ELEV (ft)	TOTAL	1	2	3	4	5	6	ROADWAY	ITR
1.06	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	1
3.88	370.0	370.0	0.0	0.0	0.0	0.0	0.0	0.00	1
5.41	740.0	740.0	0.0	0.0	0.0	0.0	0.0	0.00	1
6.67	1110.0	1110.0	0.0	0.0	0.0	0.0	0.0	0.00	1
7.77	1480.0	1480.0	0.0	0.0	0.0	0.0	0.0	0.00	1
8.78	1850.0	1850.0	0.0	0.0	0.0	0.0	0.0	0.00	1
9.72	2220.0	2220.0	0.0	0.0	0.0	0.0	0.0	0.00	1
10.61	2590.0	2590.0	0.0	0.0	0.0	0.0	0.0	0.00	1
11.50	2960.0	2960.0	0.0	0.0	0.0	0.0	0.0	0.00	1
12.56	3330.0	3297.0	0.0	0.0	0.0	0.0	0.0	31.93	3
13.44	3700.0	3553.5	0.0	0.0	0.0	0.0	0.0	147.60	3
12.06	3142.3	3142.3	0.0	0.0	0.0	0.0	0.0	OVERTOPPING	

SUMMARY OF ITERATIVE SOLUTION ERRORS FILE: SPOOK2 DATE: 11-12-1999

HEAD ELEV (ft)	HEAD ERROR (ft)	TOTAL FLOW (cfs)	FLOW ERROR (cfs)	% FLOW ERROR
1.06	0.000	0.00	0.00	0.00
3.88	0.000	370.00	0.00	0.00
5.41	0.000	740.00	0.00	0.00
6.67	0.000	1110.00	0.00	0.00
7.77	0.000	1480.00	0.00	0.00
8.78	0.000	1850.00	0.00	0.00
9.72	0.000	2220.00	0.00	0.00
10.61	0.000	2590.00	0.00	0.00
11.50	0.000	2960.00	0.00	0.00
12.56	-0.003	3330.00	1.09	0.03
13.44	0.002	3700.00	-1.08	-0.03

<1> TOLERANCE (ft) = 0.010 <2> TOLERANCE (%) = 1.000

CURRENT DATE: 11-12-1999 FILE DATE: 11-12-1999
CURRENT TIME: 07:30:43 FILE NAME: SPOOK2

PERFORMANCE CURVE FOR CULVERT 1 - 3(12.00 (ft) BY 8.00 (ft)) RCB

DIS-CHARGE FLOW (cfs)	HEAD-WATER ELEV. (ft)	INLET CONTROL DEPTH (ft)	OUTLET CONTROL DEPTH (ft)	FLOW TYPE <F4>	NORMAL DEPTH (ft)	CRIT. DEPTH (ft)	OUTLET DEPTH (ft)	TW DEPTH (ft)	OUTLET VEL. (fps)	TW VEL. (fps)
0.00	1.06	0.00	0.00	0-NF	0.00	0.00	0.00	0.00	0.00	0.00
370.00	3.88	2.56	2.82	3-M1t	1.59	1.49	2.44	2.44	4.20	4.34
740.00	5.41	4.04	4.35	3-M1t	2.52	2.36	3.64	3.64	5.64	5.45
1110.00	6.67	5.25	5.61	3-M1t	3.34	3.10	4.58	4.58	6.73	6.19
1480.00	7.77	6.33	6.71	3-M1t	4.09	3.75	5.37	5.37	7.65	6.76
1850.00	8.78	7.35	7.72	3-M1t	4.81	4.35	6.07	6.07	8.46	7.23
2220.00	9.72	8.34	8.66	3-M1t	5.50	4.92	6.71	6.71	9.19	7.62
2590.00	10.61	9.36	9.55	3-M1t	6.17	5.45	7.29	7.29	9.87	7.97
2960.00	11.50	10.44	10.39	3-M1t	6.83	5.96	7.83	7.83	10.50	8.28
3296.98	12.55	11.49	11.40	4-FFt	8.00	6.40	7.83	8.33	11.70	8.57
3553.48	13.45	12.36	12.39	4-FFt	8.00	6.73	8.00	8.81	12.34	8.82

El. inlet face invert 1.06 ft El. outlet invert 1.00 ft
El. inlet throat invert 0.00 ft El. inlet crest 0.00 ft

***** SITE DATA ***** CULVERT INVERT **********

INLET STATION	0.00 ft
INLET ELEVATION	1.06 ft
OUTLET STATION	30.00 ft
OUTLET ELEVATION	1.00 ft
NUMBER OF BARRELS	3
SLOPE (V/H)	0.0020
CULVERT LENGTH ALONG SLOPE	30.00 ft

***** CULVERT DATA SUMMARY **********

BARREL SHAPE	BOX
BARREL SPAN	12.00 ft
BARREL RISE	8.00 ft
BARREL MATERIAL	CONCRETE
BARREL MANNING'S n	0.012
INLET TYPE	CONVENTIONAL
INLET EDGE AND WALL	SQUARE EDGE (90-45 DEG.)
INLET DEPRESSION	NONE

CURRENT DATE: 11-12-1999 FILE DATE: 11-12-1999
CURRENT TIME: 07:30:43 FILE NAME: SPOOK2

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áááááááááááááááááááááááááá TAILWATER áááááááááááááááááááááááááá
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******* REGULAR CHANNEL CROSS SECTION ****************

BOTTOM WIDTH	30.00 ft
SIDE SLOPE H/V (X:1)	2.0
CHANNEL SLOPE V/H (ft/ft)	0.002
MANNING'S n (.01-0.1)	0.025
CHANNEL INVERT ELEVATION	1.00 ft
CULVERT NO.1 OUTLET INVERT ELEVATION	1.00 ft

******* UNIFORM FLOW RATING CURVE FOR DOWNSTREAM CHANNEL

FLOW (cfs)	W.S.E. (ft)	FROUDE NUMBER	DEPTH (ft)	VEL. (f/s)	SHEAR (psf)
0.00	1.00	0.000	0.00	0.00	0.00
370.00	3.44	0.489	2.44	4.34	0.31
740.00	4.64	0.503	3.64	5.45	0.46
1110.00	5.58	0.510	4.58	6.19	0.57
1480.00	6.37	0.514	5.37	6.76	0.67
1850.00	7.07	0.517	6.07	7.23	0.76
2220.00	7.71	0.519	6.71	7.62	0.84
2590.00	8.29	0.520	7.29	7.97	0.91
2960.00	8.83	0.522	7.83	8.28	0.98
3330.00	9.33	0.523	8.33	8.57	1.04
3700.00	9.81	0.524	8.81	8.82	1.10

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áááááááááááááááááááááááááá ROADWAY OVERTOPPING DATA áááááááááááááááááááááááááá
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ROADWAY SURFACE	PAVED
EMBANKMENT TOP WIDTH	20.00 ft
CREST LENGTH	30.00 ft
OVERTOPPING CREST ELEVATION	12.06 ft

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1****************************************                    ****************************************
*                                      *                    *                                      *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *                    *   U.S. ARMY CORPS OF ENGINEERS       *
*             JUN   1998               *                    *   HYDROLOGIC ENGINEERING CENTER      *
*           VERSION 4.1                *                    *         609 SECOND STREET            *
*                                      *                    *      DAVIS, CALIFORNIA 95616         *
*  RUN DATE   03JAN00  TIME  17:17:11  *                    *          (916) 756-1104              *
*                                      *                    *                                      *
****************************************                    ****************************************

                                        X     X  XXXXXXX   XXXXX          X
                                        X     X  X        X     X        XX
                                        X     X  X        X              X
                                        XXXXXXX  XXXX     X        XXXXX X
                                        X     X  X        X              X
                                        X     X  X        X     X        X
                                        X     X  XXXXXXX   XXXXX        XXX
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THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL LOSS RATE:GREEN AND AMPT INFILTRATION
KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

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1                                                HEC-1 INPUT                                                    PAGE  1

  LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

    1           ID     LAS SENDAS MASTER DRAINAGE STUDY
    2           ID
    3           ID     PROPOSED CONDITIONS MODEL
    4           ID        100-YEAR, 24-HOUR FREQUENCY
    5           ID        SCS TYPE II RAINFALL DISTRIBUTION
    6           ID
    7           ID        FILENAME:  ONLINE.IH1
    8           ID
    9           ID        THIS FILE IS A REVISION OF THE FILE LSPROPOS.IH1
   10           ID        TEST OF VOLUME FOR PHOENIX S GRAPH AND SCS METHOD
                *DIAGRAM
   11           IT       2                    900
   12           IO       0
   13           IN      15

   14           KK      51
   15           PB    3.85
   16           PC    .000    .002    .005    .008    .011    .014    .017    .020    .023    .026
   17           PC    .029    .032    .035    .038    .041    .044    .048    .052    .056    .060
   18           PC    .064    .068    .072    .076    .080    .085    .090    .095    .100    .105
   19           PC    .110    .115    .120    .126    .133    .140    .147    .155    .163    .172
   20           PC    .181    .191    .203    .218    .236    .257    .283    .387    .663    .707
   21           PC    .735    .758    .776    .791    .804    .815    .825    .834    .842    .849
   22           PC    .856    .863    .869    .875    .881    .887    .893    .898    .903    .908
   23           PC    .913    .918    .922    .926    .930    .934    .938    .942    .946    .950
   24           PC    .953    .956    .959    .962    .965    .968    .971    .974    .977    .980
   25           PC    .983    .986    .989    .992    .995    .998   1.000
   26           KM        RUNOFF HYDROGRAPH FROM SUB-BASIN 51
   27           BA     .26
   28           LS            86.3       0
   29           UD     .17

   30           KK    DIV1
   31           KM        DIVERT FLOW INTO OFFLINE DETENTION BASIN
   32           KM        WEIR FOR BASIN SET AT 4 FEET ABOVE CHANNEL BOTTOM
                *      1
   33           DT  BASIN1
   34           DI       0    24.4    70.8   132.2   194.1   281.1   415.5   571.9   753.2
   35           DQ       0       0       0       0       0    57.3     162   297.6   458.2

   36           KK    DIV2
   37           KM        SPLIT OUT FLOW FOR WASHES THAT FLOW TO THE SOUTH FROM
   38           KM        WASHES THAT DRAIN TO THE WEST, SOUTHERN WASHES FED BY 30" AND 18" PIPE
   39           DT    WA30
   40           DI       0    24.4    70.8   132.2   194.1   223.8   253.5  274.25     295
   41           DQ       0     8.4    24.8    40.2    52.1    57.8    63.5    67.3      71

   42           KK     R51
   43           KM        ROUTE FLOW FROM SUB-BASIN 51 TO C101
   44           RS       3    FLOW      -1
   45           RC     .05    .035     .05    3800    .044
   46           RX    1000    1010    1020    1036    1041    1057    1067    1077
   47           RY   14.88   14.44      14      10      10      14   14.44   14.88
1                                                HEC-1 INPUT                                                    PAGE  2

  LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

   48           KK      50
   49           KM        RUNOFF HYDROGRAPH FROM SUB-BASIN 50
   50           BA     .19
   51           LS            85.1       0
   52           UD     .21

   53           KK    C101
   54           KM        COMBINE HYDROGRAPHS FROM SUB-BASINS 50 AND 51
   55           HC       2

   56           KK    DIV3
   57           KM        RESERVOIR AT THE EDGE OF THE PROPERTY, FLOW FROM 10' WIDE CHANNEL
   58           KM        DIVERTED INTO OFFLINE BASIN OVER A 150' WEIR SET AT 0.75 FEET
   59           KM        ABOVE CHANNEL
                *      1
   60           DT  BASIN2
   61           DI       0      18    59.3   121.6   255.8   454.1   703.1   998.3  1338.4
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STATION C119

(O) OUTFLOW

DAHRMN	PER	0.	100.	200.	300.	400.	500.	600.	700.	800.	900.	0.	0.	0.
10000	10													
10002	20													
10004	30													
10006	40													
10008	50													
10010	60													
10012	70													
10014	80													
10016	90													
10018	100													
10020	110													
10022	120													
10024	130													
10026	140													
10028	150													
10030	160													
10032	170													
10034	180													
10036	190													
10038	200													
10040	210													
10042	220													
10044	230													
10046	240													
10048	250													
10050	260													
10052	270													
10054	280													
10056	290													
10058	300													
10100	310													
10102	320													
10104	330													
10106	340													
10108	350													
10110	360													
10112	370													
10114	380													
10116	390													
10118	400													
10120	410													
10122	420													
10124	430													
10126	440													
10128	450													
10130	460													
10132	470													
10134	480													
10136	490													
10138	500													
10140	510													
10142	520													
10144	530													
10146	540													
10148	550													
10150	560													
10152	570													
10154	580													
10156	590													
10158	600													
10200	610													
10202	620													
10204	630													
10206	640													
10208	650													
10210	660													
10212	670													
10214	680													
10216	690													
10218	700													
10220	710													
10222	720													
10224	730													
10226	740													
10228	750													
10230	760													
10232	770													
10234	780													
10236	790													
10238	800													
10240	810													
10242	820													
10244	830													
10246	840													
10248	850													
10250	860													
10252	870													
10254	880													
10256	890													
10258	900													
10300	910													
10302	920													
10304	930													
10306	940													
10308	950													
10310	960													
10312	970													
10314	980													
10316	990													
10318	1000													
10320	1010													
10322	1020													
10324	1030													
10326	1040													
10328	1050													
10330	1060													
10332	1070													
10334	1080													

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10340 1110
10342 1120
10344 1130
10346 1140
10348 1150
10350 1160
10352 1170
10354 1180
10356 1190
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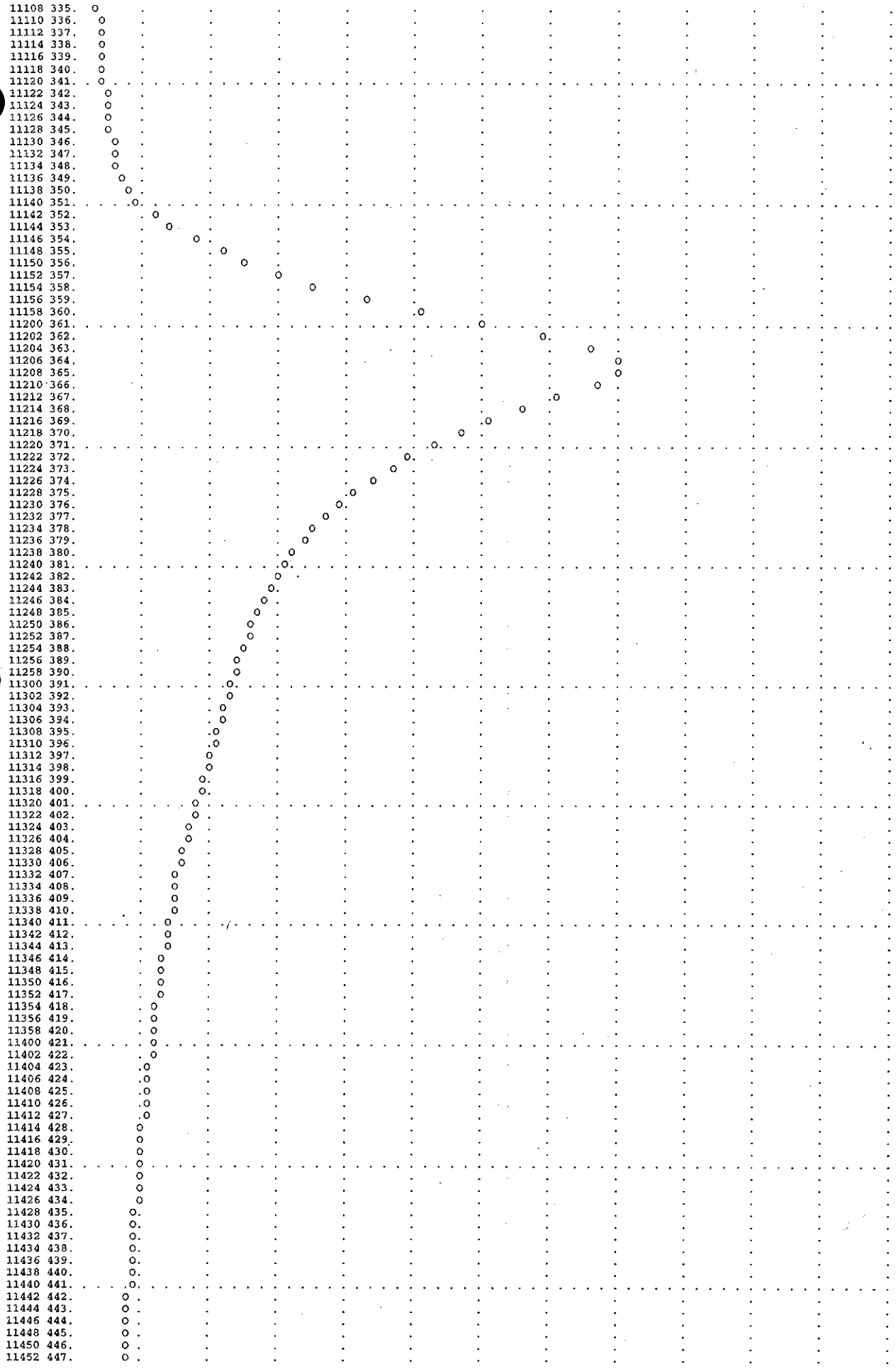

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11456 449.       O .
11458 450.      O  .
11500 451. . . .O. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
11502 452.      O  .
11504 453.      O  .
11506 454.      O  .
11508 455.      O  .
11510 456.      O  .
11512 457.      O  .
11514 458.      O  .
11516 459.      O  .
11518 460.      O  .
11520 461. . . .O. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
11522 462.      O  .
11524 463.      O  .
11526 464.      O  .
11528 465.      O  .
11530 466.      O  .
11532 467.     O   .
11534 468.     O   .
11536 469.     O   .
11538 470.     O   .
11540 471. . . O . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
11542 472.     O   .
11544 473.     O   .
11546 474.     O   .
11548 475.     O   .
11550 476.     O   .
11552 477.     O   .
11554 478.     O   .
11556 479.     O   .
11558 480.     O   .
11600 481. . . O . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
11602 482.     O   .
11604 483.     O   .
11606 484.     O   .
11608 485.     O   .
11610 486.     O   .
11612 487.     O   .
11614 488.     O   .
11616 489.     O   .
11618 490.     O   .
11620 491. . .O. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
11622 492.    O    .
11624 493.    O    .
11626 494.    O    .
11628 495.    O    .
11630 496.    O    .
11632 497.    O    .
11634 498.    O    .
11636 499.    O    .
11638 500.    O    .
11640 501. . .O. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
11642 502.    O    .
11644 503.    O    .
11646 504.    O    .
11648 505.    O    .
11650 506.    O    .
11652 507.    O    .
11654 508.    O    .
11656 509.    O    .
11658 510.    O    .
11700 511. . .O. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
11702 512.    O    .
11704 513.    O    .
11706 514.    O    .
11708 515.    O    .
11710 516.    O    .
11712 517.    O    .
11714 518.    O    .
11716 519.    O    .
11718 520.    O    .
11720 521. . .O. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
11722 522.    O    .
11724 523.    O    .
11726 524.    O    .
11728 525.    O    .
11730 526.    O    .
11732 527.    O    .
11734 528.    O    .
11736 529.   O     .
11738 530.   O     .
11740 531. . O . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
11742 532.   O     .
11744 533.   O     .
11746 534.   O     .
11748 535.   O     .
11750 536.   O     .
11752 537.   O     .
11754 538.   O     .
11756 539.   O     .
11758 540.   O     .
11800 541. . O . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
11802 542.   O     .
11804 543.   O     .
11806 544.   O     .
11808 545.   O     .
11810 546.   O     .
11812 547.   O     .
11814 548.   O     .
11816 549.   O     .
11818 550.   O     .
11820 551. . O . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
11822 552.   O     .
11824 553.   O     .
11826 554.   O     .
11828 555.   O     .
11830 556.   O     .
11832 557.   O     .
11834 558.   O     .
11836 559.   O     .
11838 560.   O     .
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11840 561. . O . . . . . .
11842 562. O . . . . . .
11844 563. O . . . . . .
11846 564. O . . . . . .
11848 565. O . . . . . .
11850 566. O . . . . . .
11852 567. O . . . . . .
11854 568. O . . . . . .
11856 569. O . . . . . .
11858 570. O . . . . . .
11900 571. . O . . . . . .
11902 572. O . . . . . .
11904 573. O . . . . . .
11906 574. O . . . . . .
11908 575. O . . . . . .
11910 576. O . . . . . .
11912 577. O . . . . . .
11914 578. O . . . . . .
11916 579. O . . . . . .
11918 580. O . . . . . .
11920 581. . O . . . . . .
11922 582. O . . . . . .
11924 583. O . . . . . .
11926 584. O . . . . . .
11928 585. O . . . . . .
11930 586. O . . . . . .
11932 587. O . . . . . .
11934 588. O . . . . . .
11936 589. O . . . . . .
11938 590. O . . . . . .
11940 591. . O . . . . . .
11942 592. O . . . . . .
11944 593. O . . . . . .
11946 594. O . . . . . .
11948 595. O . . . . . .
11950 596. O . . . . . .
11952 597. O . . . . . .
11954 598. O . . . . . .
11956 599. O . . . . . .
11958 600. O . . . . . .
12000 601. .O. . . . . .
12002 602. O . . . . . .
12004 603. O . . . . . .
12006 604. O . . . . . .
12008 605. O . . . . . .
12010 606. O . . . . . .
12012 607. O . . . . . .
12014 608. O . . . . . .
12016 609. O . . . . . .
12018 610. O . . . . . .
12020 611. .O. . . . . .
12022 612. O . . . . . .
12024 613. O . . . . . .
12026 614. O . . . . . .
12028 615. O . . . . . .
12030 616. O . . . . . .
12032 617. O . . . . . .
12034 618. O . . . . . .
12036 619. O . . . . . .
12038 620. O . . . . . .
12040 621. .O. . . . . .
12042 622. O . . . . . .
12044 623. O . . . . . .
12046 624. O . . . . . .
12048 625. O . . . . . .
12050 626. O . . . . . .
12052 627. O . . . . . .
12054 628. O . . . . . .
12056 629. O . . . . . .
12058 630. O . . . . . .
12100 631. .O. . . . . .
12102 632. O . . . . . .
12104 633. O . . . . . .
12106 634. O . . . . . .
12108 635. O . . . . . .
12110 636. O . . . . . .
12112 637. O . . . . . .
12114 638. O . . . . . .
12116 639. O . . . . . .
12118 640. O . . . . . .
12120 641. .O. . . . . .
12122 642. O . . . . . .
12124 643. O . . . . . .
12126 644. O . . . . . .
12128 645. O . . . . . .
12130 646. O . . . . . .
12132 647. O . . . . . .
12134 648. O . . . . . .
12136 649. O . . . . . .
12138 650. O . . . . . .
12140 651. .O. . . . . .
12142 652. O . . . . . .
12144 653. O . . . . . .
12146 654. O . . . . . .
12148 655. O . . . . . .
12150 656. O . . . . . .
12152 657. O . . . . . .
12154 658. O . . . . . .
12156 659. O . . . . . .
12158 660. O . . . . . .
12200 661. .O. . . . . .
12202 662. O . . . . . .
12204 663. O . . . . . .
12206 664. O . . . . . .
12208 665. O . . . . . .
12210 666. O . . . . . .
12212 667. O . . . . . .
12214 668. O . . . . . .
12216 669. O . . . . . .
12218 670. O . . . . . .
12220 671. .O. . . . . .
12222 672. O . . . . . .
12224 673. O . . . . . .

12226 674. O
12228 675. O
12230 676. O
12232 677. O
12234 678. O
12236 679. O
12238 680. O
12240 681. .O.
12242 682. O
12244 683. O
12246 684. O
12248 685. O
12250 686. O
12252 687. O
12254 688. O
12256 689. O
12258 690. O
12300 691. .O.
12302 692. O
12304 693. O
12306 694. O
12308 695. O
12310 696. O
12312 697. O
12314 698. O
12316 699. O
12318 700. O
12320 701. .O.
12322 702. O
12324 703. O
12326 704. O
12328 705. O
12330 706. O
12332 707. O
12334 708. O
12336 709. O
12338 710. O
12340 711. .O.
12342 712. O
12344 713. O
12346 714. O
12348 715. O
12350 716. O
12352 717. O
12354 718. O
12356 719. O
12358 720. O
20000 721. .O.
20002 722. O
20004 723. O
20006 724. O
20008 725. O
20010 726. O
20012 727. O
20014 728. O
20016 729. O
20018 730. O
20020 731. O
20022 732. O
20024 733.O
20026 734.O
20028 735.O
20030 736.O
20032 737.O
20034 738.O
20036 739.O
20038 740.O
20040 741.O.
20042 742.O
20044 743.O
20046 744.O
20048 745.O
20050 746.O
20052 747.O
20054 748.O
20056 749.O
20058 750.O
20100 7510
20102 7520
20104 7530
20106 7540
20108 7550
20110 7560
20112 7570
20114 7580
20116 7590
20118 7600
20120 7610
20122 7620
20124 7630
20126 7640
20128 7650
20130 7660
20132 7670
20134 7680
20136 7690
20138 7700
20140 7710
20142 7720
20144 7730
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20152 7770
20154 7780
20156 7790
20158 7800
20200 7810
20202 7820
20204 7830
20206 7840
20208 7850
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20212 7870
20214 7880
20216 7890
20218 7900
20220 7910
20222 7920
20224 7930
20226 7940
20228 7950
20230 7960
20232 7970
20234 7980
20236 7990
20238 8000
20240 8010
20242 8020
20244 8030
20246 8040
20248 8050
20250 8060
20252 8070
20254 8080
20256 8090
20258 8100
20300 8110
20302 8120
20304 8130
20306 8140
20308 8150
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20312 8170
20314 8180
20316 8190
20318 8200
20320 8210
20322 8220
20324 8230
20326 8240
20328 8250
20330 8260
20332 8270
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20336 8290
20338 8300
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20344 8330
20346 8340
20348 8350
20350 8360
20352 8370
20354 8380
20356 8390
20358 8400
20400 8410
20402 8420
20404 8430
20406 8440
20408 8450
20410 8460
20412 8470
20414 8480
20416 8490
20418 8500
20420 8510
20422 8520
20424 8530
20426 8540
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20430 8560
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20434 8580
20436 8590
20438 8600
20440 8610
20442 8620
20444 8630
20446 8640
20448 8650
20450 8660
20452 8670
20454 8680
20456 8690
20458 8700
20500 8710
20502 8720
20504 8730
20506 8740
20508 8750
20510 8760
20512 8770
20514 8780
20516 8790
20518 8800
20520 8810
20522 8820
20524 8830
20526 8840
20528 8850
20530 8860
20532 8870
20534 8880
20536 8890
20538 8900
20540 8910
20542 8920
20544 8930
20546 8940
20548 8950
20550 8960
20552 8970
20554 8980
20556 8990

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415 KK      *     C119   *
            *            *
            **************
                                COMBINE HYDROGRAPHS FROM SUB-BASIN 71 AND C119

417 KO            OUTPUT CONTROL VARIABLES
                        IPRNT          1  PRINT CONTROL
                        IPLOT          2  PLOT CONTROL
                        QSCAL         0.  HYDROGRAPH PLOT SCALE

418 HC            HYDROGRAPH COMBINATION
                        ICOMP          2  NUMBER OF HYDROGRAPHS TO COMBINE
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HYDROGRAPH AT STATION C119
SUM OF 2 HYDROGRAPHS

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DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW
1		0000	1	0.	1		0730	226	0.	1		1500	451	74.	1		2230	676	27.
1		0002	2	0.	1		0732	227	0.	1		1502	452	73.	1		2232	677	27.
1		0004	3	0.	1		0734	228	0.	1		1504	453	73.	1		2234	678	27.
1		0006	4	0.	1		0736	229	0.	1		1506	454	72.	1		2236	679	27.
1		0008	5	0.	1		0738	230	0.	1		1508	455	71.	1		2238	680	27.
1		0010	6	0.	1		0740	231	0.	1		1510	456	71.	1		2240	681	27.
1		0012	7	0.	1		0742	232	0.	1		1512	457	70.	1		2242	682	27.
1		0014	8	0.	1		0744	233	0.	1		1514	458	70.	1		2244	683	27.
1		0016	9	0.	1		0746	234	0.	1		1516	459	69.	1		2246	684	27.
1		0018	10	0.	1		0748	235	0.	1		1518	460	69.	1		2248	685	27.
1		0020	11	0.	1		0750	236	0.	1		1520	461	68.	1		2250	686	27.
1		0022	12	0.	1		0752	237	0.	1		1522	462	68.	1		2252	687	27.
1		0024	13	0.	1		0754	238	1.	1		1524	463	67.	1		2254	688	27.
1		0026	14	0.	1		0756	239	1.	1		1526	464	67.	1		2256	689	27.
1		0028	15	0.	1		0758	240	1.	1		1528	465	66.	1		2258	690	27.
1		0030	16	0.	1		0800	241	1.	1		1530	466	65.	1		2300	691	27.
1		0032	17	0.	1		0802	242	1.	1		1532	467	64.	1		2302	692	27.
1		0034	18	0.	1		0804	243	1.	1		1534	468	63.	1		2304	693	27.
1		0036	19	0.	1		0806	244	1.	1		1536	469	62.	1		2306	694	27.
1		0038	20	0.	1		0808	245	1.	1		1538	470	62.	1		2308	695	27.
1		0040	21	0.	1		0810	246	1.	1		1540	471	61.	1		2310	696	27.
1		0042	22	0.	1		0812	247	1.	1		1542	472	60.	1		2312	697	27.
1		0044	23	0.	1		0814	248	1.	1		1544	473	60.	1		2314	698	27.
1		0046	24	0.	1		0816	249	1.	1		1546	474	59.	1		2316	699	27.
1		0048	25	0.	1		0818	250	1.	1		1548	475	59.	1		2318	700	27.
1		0050	26	0.	1		0820	251	1.	1		1550	476	58.	1		2320	701	27.
1		0052	27	0.	1		0822	252	1.	1		1552	477	58.	1		2322	702	27.
1		0054	28	0.	1		0824	253	1.	1		1554	478	58.	1		2324	703	27.
1		0056	29	0.	1		0826	254	1.	1		1556	479	57.	1		2326	704	27.
1		0058	30	0.	1		0828	255	1.	1		1558	480	57.	1		2328	705	27.
1		0100	31	0.	1		0830	256	1.	1		1600	481	57.	1		2330	706	27.
1		0102	32	0.	1		0832	257	1.	1		1602	482	57.	1		2332	707	27.
1		0104	33	0.	1		0834	258	1.	1		1604	483	56.	1		2334	708	27.
1		0106	34	0.	1		0836	259	1.	1		1606	484	56.	1		2336	709	27.
1		0108	35	0.	1		0838	260	1.	1		1608	485	56.	1		2338	710	27.
1		0110	36	0.	1		0840	261	1.	1		1610	486	56.	1		2340	711	27.
1		0112	37	0.	1		0842	262	1.	1		1612	487	56.	1		2342	712	27.
1		0114	38	0.	1		0844	263	1.	1		1614	488	55.	1		2344	713	27.
1		0116	39	0.	1		0846	264	2.	1		1616	489	55.	1		2346	714	27.
1		0118	40	0.	1		0848	265	2.	1		1618	490	55.	1		2348	715	27.
1		0120	41	0.	1		0850	266	2.	1		1620	491	55.	1		2350	716	27.
1		0122	42	0.	1		0852	267	2.	1		1622	492	55.	1		2352	717	26.
1		0124	43	0.	1		0854	268	2.	1		1624	493	55.	1		2354	718	26.
1		0126	44	0.	1		0856	269	2.	1		1626	494	54.	1		2356	719	26.
1		0128	45	0.	1		0858	270	2.	1		1628	495	54.	1		2358	720	26.
1		0130	46	0.	1		0900	271	2.	1		1630	496	54.	2		0000	721	25.
1		0132	47	0.	1		0902	272	2.	1		1632	497	54.	2		0002	722	25.
1		0134	48	0.	1		0904	273	2.	1		1634	498	54.	2		0004	723	24.
1		0136	49	0.	1		0906	274	2.	1		1636	499	54.	2		0006	724	23.
1		0138	50	0.	1		0908	275	2.	1		1638	500	54.	2		0008	725	23.
1		0140	51	0.	1		0910	276	2.	1		1640	501	53.	2		0010	726	22.
1		0142	52	0.	1		0912	277	2.	1		1642	502	53.	2		0012	727	21.
1		0144	53	0.	1		0914	278	3.	1		1644	503	52.	2		0014	728	20.
1		0146	54	0.	1		0916	279	3.	1		1646	504	51.	2		0016	729	19.
1		0148	55	0.	1		0918	280	3.	1		1648	505	51.	2		0018	730	18.
1		0150	56	0.	1		0920	281	3.	1		1650	506	50.	2		0020	731	16.
1		0152	57	0.	1		0922	282	3.	1		1652	507	49.	2		0022	732	15.
1		0154	58	0.	1		0924	283	3.	1		1654	508	49.	2		0024	733	14.
1		0156	59	0.	1		0926	284	4.	1		1656	509	48.	2		0026	734	13.
1		0158	60	0.	1		0928	285	4.	1		1658	510	48.	2		0028	735	12.
1		0200	61	0.	1		0930	286	4.	1		1700	511	48.	2		0030	736	11.
1		0202	62	0.	1		0932	287	4.	1		1702	512	47.	2		0032	737	10.
1		0204	63	0.	1		0934	288	4.	1		1704	513	47.	2		0034	738	10.
1		0206	64	0.	1		0936	289	5.	1		1706	514	47.	2		0036	739	9.
1		0208	65	0.	1		0938	290	5.	1		1708	515	47.	2		0038	740	9.
1		0210	66	0.	1		0940	291	5.	1		1710	516	46.	2		0040	741	8.
1		0212	67	0.	1		0942	292	5.	1		1712	517	46.	2		0042	742	8.
1		0214	68	0.	1		0944	293	5.	1		1714	518	46.	2		0044	743	7.
1		0216	69	0.	1		0946	294	6.	1		1716	519	46.	2		0046	744	7.
1		0218	70	0.	1		0948	295	6.	1		1718	520	46.	2		0048	745	6.
1		0220	71	0.	1		0950	296	6.	1		1720	521	46.	2		0050	746	6.
1		0222	72	0.	1		0952	297	7.	1		1722	522	46.	2		0052	747	6.
1		0224	73	0.	1		0954	298	7.	1		1724	523	45.	2		0054	748	6.
1		0226	74	0.	1		0956	299	7.	1		1726	524	45.	2		0056	749	5.
1		0228	75	0.	1		0958	300	7.	1		1728	525	45.	2		0058	750	5.
1		0230	76	0.	1		1000	301	8.	1		1730	526	45.	2		0100	751	5.
1		0232	77	0.	1		1002	302	8.	1		1732	527	45.	2		0102	752	5.
1		0234	78	0.	1		1004	303	8.	1		1734	528	45.	2		0104	753	4.
1		0236	79	0.	1		1006	304	9.	1		1736	529	45.	2		0106	754	4.
1		0238	80	0.	1		1008	305	9.	1		1738	530	45.	2		0108	755	4.
1		0240	81	0.	1		1010	306	9.	1		1740	531	45.	2		0110	756	4.
1		0242	82	0.	1		1012	307	10.	1		1742	532	45.	2		0112	757	4.
1		0244	83	0.	1		1014	308	10.	1		1744	533	45.	2		0114	758	4.
1		0246	84	0.	1		1016	309	10.	1		1746	534	45.	2		0116	759	3.

1	0248	85	0.	*	1	1018	310	11.	*	1	1748	535	45.	*	2	0118	760	3.
1	0250	86	0.	*	1	1020	311	11.	*	1	1750	536	44.	*	2	0120	761	3.
1	0252	87	0.	*	1	1022	312	11.	*	1	1752	537	44.	*	2	0122	762	3.
1	0254	88	0.	*	1	1024	313	12.	*	1	1754	538	44.	*	2	0124	763	3.
1	0256	89	0.	*	1	1026	314	12.	*	1	1756	539	44.	*	2	0126	764	3.
1	0258	90	0.	*	1	1028	315	13.	*	1	1758	540	43.	*	2	0128	765	3.
1	0300	91	0.	*	1	1030	316	13.	*	1	1800	541	43.	*	2	0130	766	3.
1	0302	92	0.	*	1	1032	317	14.	*	1	1802	542	42.	*	2	0132	767	2.
1	0304	93	0.	*	1	1034	318	15.	*	1	1804	543	41.	*	2	0134	768	2.
1	0306	94	0.	*	1	1036	319	15.	*	1	1806	544	41.	*	2	0136	769	2.
1	0308	95	0.	*	1	1038	320	16.	*	1	1808	545	40.	*	2	0138	770	2.
1	0310	96	0.	*	1	1040	321	17.	*	1	1810	546	40.	*	2	0140	771	2.
1	0312	97	0.	*	1	1042	322	17.	*	1	1812	547	39.	*	2	0142	772	2.
1	0314	98	0.	*	1	1044	323	18.	*	1	1814	548	39.	*	2	0144	773	2.
1	0316	99	0.	*	1	1046	324	19.	*	1	1816	549	39.	*	2	0146	774	2.
1	0318	100	0.	*	1	1048	325	20.	*	1	1818	550	38.	*	2	0148	775	2.
1	0320	101	0.	*	1	1050	326	21.	*	1	1820	551	38.	*	2	0150	776	2.
1	0322	102	0.	*	1	1052	327	22.	*	1	1822	552	38.	*	2	0152	777	2.
1	0324	103	0.	*	1	1054	328	23.	*	1	1824	553	38.	*	2	0154	778	2.
1	0326	104	0.	*	1	1056	329	24.	*	1	1826	554	37.	*	2	0156	779	1.
1	0328	105	0.	*	1	1058	330	26.	*	1	1828	555	37.	*	2	0158	780	1.
1	0330	106	0.	*	1	1100	331	27.	*	1	1830	556	37.	*	2	0200	781	1.
1	0332	107	0.	*	1	1102	332	29.	*	1	1832	557	37.	*	2	0202	782	1.
1	0334	108	0.	*	1	1104	333	31.	*	1	1834	558	37.	*	2	0204	783	1.
1	0336	109	0.	*	1	1106	334	32.	*	1	1836	559	37.	*	2	0206	784	1.
1	0338	110	0.	*	1	1108	335	34.	*	1	1838	560	37.	*	2	0208	785	1.
1	0340	111	0.	*	1	1110	336	36.	*	1	1840	561	37.	*	2	0210	786	1.
1	0342	112	0.	*	1	1112	337	37.	*	1	1842	562	37.	*	2	0212	787	1.
1	0344	113	0.	*	1	1114	338	39.	*	1	1844	563	37.	*	2	0214	788	1.
1	0346	114	0.	*	1	1116	339	41.	*	1	1846	564	36.	*	2	0216	789	1.
1	0348	115	0.	*	1	1118	340	43.	*	1	1848	565	36.	*	2	0218	790	1.
1	0350	116	0.	*	1	1120	341	44.	*	1	1850	566	36.	*	2	0220	791	1.
1	0352	117	0.	*	1	1122	342	47.	*	1	1852	567	36.	*	2	0222	792	1.
1	0354	118	0.	*	1	1124	343	49.	*	1	1854	568	36.	*	2	0224	793	1.
1	0356	119	0.	*	1	1126	344	51.	*	1	1856	569	36.	*	2	0226	794	1.
1	0358	120	0.	*	1	1128	345	53.	*	1	1858	570	36.	*	2	0228	795	1.
1	0400	121	0.	*	1	1130	346	56.	*	1	1900	571	36.	*	2	0230	796	1.
1	0402	122	0.	*	1	1132	347	59.	*	1	1902	572	36.	*	2	0232	797	1.
1	0404	123	0.	*	1	1134	348	63.	*	1	1904	573	36.	*	2	0234	798	1.
1	0406	124	0.	*	1	1136	349	68.	*	1	1906	574	36.	*	2	0236	799	1.
1	0408	125	0.	*	1	1138	350	78.	*	1	1908	575	36.	*	2	0238	800	1.
1	0410	126	0.	*	1	1140	351	94.	*	1	1910	576	36.	*	2	0240	801	1.
1	0412	127	0.	*	1	1142	352	116.	*	1	1912	577	36.	*	2	0242	802	1.
1	0414	128	0.	*	1	1144	353	145.	*	1	1914	578	36.	*	2	0244	803	1.
1	0416	129	0.	*	1	1146	354	181.	*	1	1916	579	36.	*	2	0246	804	1.
1	0418	130	0.	*	1	1148	355	220.	*	1	1918	580	36.	*	2	0248	805	0.
1	0420	131	0.	*	1	1150	356	255.	*	1	1920	581	36.	*	2	0250	806	0.
1	0422	132	0.	*	1	1152	357	299.	*	1	1922	582	36.	*	2	0252	807	0.
1	0424	133	0.	*	1	1154	358	354.	*	1	1924	583	36.	*	2	0254	808	0.
1	0426	134	0.	*	1	1156	359	425.	*	1	1926	584	36.	*	2	0256	809	0.
1	0428	135	0.	*	1	1158	360	507.	*	1	1928	585	36.	*	2	0258	810	0.
1	0430	136	0.	*	1	1200	361	597.	*	1	1930	586	35.	*	2	0300	811	0.
1	0432	137	0.	*	1	1202	362	685.	*	1	1932	587	35.	*	2	0302	812	0.
1	0434	138	0.	*	1	1204	363	758.	*	1	1934	588	35.	*	2	0304	813	0.
1	0436	139	0.	*	1	1206	364	800.	*	1	1936	589	35.	*	2	0306	814	0.
1	0438	140	0.	*	1	1208	365	801.	*	1	1938	590	35.	*	2	0308	815	0.
1	0440	141	0.	*	1	1210	366	767.	*	1	1940	591	35.	*	2	0310	816	0.
1	0442	142	0.	*	1	1212	367	714.	*	1	1942	592	35.	*	2	0312	817	0.
1	0444	143	0.	*	1	1214	368	660.	*	1	1944	593	35.	*	2	0314	818	0.
1	0446	144	0.	*	1	1216	369	610.	*	1	1946	594	35.	*	2	0316	819	0.
1	0448	145	0.	*	1	1218	370	565.	*	1	1948	595	35.	*	2	0318	820	0.
1	0450	146	0.	*	1	1220	371	528.	*	1	1950	596	35.	*	2	0320	821	0.
1	0452	147	0.	*	1	1222	372	495.	*	1	1952	597	35.	*	2	0322	822	0.
1	0454	148	0.	*	1	1224	373	465.	*	1	1954	598	35.	*	2	0324	823	0.
1	0456	149	0.	*	1	1226	374	439.	*	1	1956	599	35.	*	2	0326	824	0.
1	0458	150	0.	*	1	1228	375	414.	*	1	1958	600	34.	*	2	0328	825	0.
1	0500	151	0.	*	1	1230	376	390.	*	1	2000	601	34.	*	2	0330	826	0.
1	0502	152	0.	*	1	1232	377	370.	*	1	2002	602	33.	*	2	0332	827	0.
1	0504	153	0.	*	1	1234	378	352.	*	1	2004	603	32.	*	2	0334	828	0.
1	0506	154	0.	*	1	1236	379	337.	*	1	2006	604	32.	*	2	0336	829	0.
1	0508	155	0.	*	1	1238	380	323.	*	1	2008	605	31.	*	2	0338	830	0.
1	0510	156	0.	*	1	1240	381	311.	*	1	2010	606	31.	*	2	0340	831	0.
1	0512	157	0.	*	1	1242	382	300.	*	1	2012	607	31.	*	2	0342	832	0.
1	0514	158	0.	*	1	1244	383	290.	*	1	2014	608	30.	*	2	0344	833	0.
1	0516	159	0.	*	1	1246	384	280.	*	1	2016	609	30.	*	2	0346	834	0.
1	0518	160	0.	*	1	1248	385	272.	*	1	2018	610	30.	*	2	0348	835	0.
1	0520	161	0.	*	1	1250	386	264.	*	1	2020	611	30.	*	2	0350	836	0.
1	0522	162	0.	*	1	1252	387	257.	*	1	2022	612	29.	*	2	0352	837	0.
1	0524	163	0.	*	1	1254	388	250.	*	1	2024	613	29.	*	2	0354	838	0.
1	0526	164	0.	*	1	1256	389	244.	*	1	2026	614	29.	*	2	0356	839	0.
1	0528	165	0.	*	1	1258	390	238.	*	1	2028	615	29.	*	2	0358	840	0.
1	0530	166	0.	*	1	1300	391	231.	*	1	2030	616	29.	*	2	0400	841	0.
1	0532	167	0.	*	1	1302	392	226.	*	1	2032	617	29.	*	2	0402	842	0.
1	0534	168	0.	*	1	1304	393	220.	*	1	2034	618	29.	*	2	0404	843	0.
1	0536	169	0.	*	1	1306	394	216.	*	1	2036	619	28.	*	2	0406	844	0.
1	0538	170	0.	*	1	1308	395	211.	*	1	2038	620	28.	*	2	0408	845	0.
1	0540	171	0.	*	1	1310	396	207.	*	1	2040	621	28.	*	2	0410	846	0.
1	0542	172	0.	*	1	1312	397	202.	*	1	2042	622	28.	*	2	0412	847	0.
1	0544	173	0.	*	1	1314	398	196.	*	1	2044	623	28.	*	2	0414	848	0.
1	0546	174	0.	*	1	1316	399	191.	*	1	2046	624	28.	*	2	0416	849	0.
1	0548	175	0.	*	1	1318	400	185.	*	1	2048	625	28.	*	2	0418	850	0.
1	0550	176	0.	*	1	1320	401	180.	*	1	2050	626	28.	*	2	0420	851	0.
1	0552	177	0.	*	1	1322	402	176.	*	1	2052	627	28.	*	2	0422	852	0.
1	0554	178	0.	*	1	1324	403	171.	*	1	2054	628	28.	*	2	0424	853	0.
1	0556	179	0.	*	1	1326	404	166.	*	1	2056	629	28.	*	2	0426	854	0.
1	0558	180	0.	*	1	1328	405	162.	*	1	2058	630	28.	*	2	0428	855	0.
1	0600	181	0.	*	1	1330	406	158.	*	1	2100	631	28.	*	2	0430	856	0.
1	0602	182	0.	*	1	1332	407	154.	*	1	2102	632	28.	*	2	0432	857	0.
1	0604	183	0.	*	1	1334	408	151.	*	1	2104	633	27.	*	2	0434	858	0.
1	0606	184	0.	*	1	1336	409	148.	*	1	2106	634	27.	*	2	0436	859	0.
1	0608	185	0.	*	1	1338	410	146.	*	1	2108	635	27.	*	2	0438	860	0.
1	0610	186	0.	*	1	1340	411	143.	*	1	2110	636	27.	*	2	0440	861	0.
1	0612	187	0.	*	1	1342	412	140.	*	1	2112	637	27.	*	2	0442	862	0.
1	0614	188	0.	*	1	1344	413	137.	*	1	2114	638	27.	*	2	0444	863	0.
1	0616	189	0.	*	1	1346	414	134.	*	1	2116	639	27.	*	2	0446	864	0.
1	0618	190	0.	*	1	1348	415	131.	*	1	2118	640	27.	*	2	0448	865	0.
1	0620	191	0.	*	1	1350	416	129.	*	1	2120	641	27.	*	2	0450	866	0.
1	0622	192	0.	*	1	1352	417	126.	*	1	2123	642	27.	*	2	0452	867	0.
1	0624	193	0.	*	1	1354	418	124.	*	1	2124	643	27.	*	2	0454	868	0.
1	0626	194	0.	*	1	1356	419	122.	*	1	2126	644	27.	*	2	0456	869	0.
1	0628	195	0.	*	1	1358	420	119.	*	1	2128	645	27.	*	2	0458	870	0.
1	0630	196	0.	*	1	1400	421	117.	*	1	2130	646	27.	*	2	0500	871	0.
1	0632	197	0.	*	1	1402	422	115.	*	1	2132	647	27.	*	2	0502	872	0.

1	0634	198	0.	*	1	1404	423	113.	*	1	2134	648	27.	*	2	0504	873	0.
1	0636	199	0.	*	1	1406	424	112.	*	1	2136	649	27.	*	2	0506	874	0.
1	0638	200	0.	*	1	1408	425	110.	*	1	2138	650	27.	*	2	0508	875	0.
1	0640	201	0.	*	1	1410	426	108.	*	1	2140	651	27.	*	2	0510	876	0.
1	0642	202	0.	*	1	1412	427	106.	*	1	2142	652	27.	*	2	0512	877	0.
1	0644	203	0.	*	1	1414	428	105.	*	1	2144	653	27.	*	2	0514	878	0.
1	0646	204	0.	*	1	1416	429	103.	*	1	2146	654	27.	*	2	0516	879	0.
1	0648	205	0.	*	1	1418	430	101.	*	1	2148	655	27.	*	2	0518	880	0.
1	0650	206	0.	*	1	1420	431	100.	*	1	2150	656	27.	*	2	0520	881	0.
1	0652	207	0.	*	1	1422	432	99.	*	1	2152	657	27.	*	2	0522	882	0.
1	0654	208	0.	*	1	1424	433	97.	*	1	2154	658	27.	*	2	0524	883	0.
1	0656	209	0.	*	1	1426	434	96.	*	1	2156	659	27.	*	2	0526	884	0.
1	0658	210	0.	*	1	1428	435	94.	*	1	2158	660	27.	*	2	0528	885	0.
1	0700	211	0.	*	1	1430	436	93.	*	1	2200	661	27.	*	2	0530	886	0.
1	0702	212	0.	*	1	1432	437	91.	*	1	2202	662	27.	*	2	0532	887	0.
1	0704	213	0.	*	1	1434	438	90.	*	1	2204	663	27.	*	2	0534	888	0.
1	0706	214	0.	*	1	1436	439	88.	*	1	2206	664	27.	*	2	0536	889	0.
1	0708	215	0.	*	1	1438	440	87.	*	1	2208	665	27.	*	2	0538	890	0.
1	0710	216	0.	*	1	1440	441	86.	*	1	2210	666	27.	*	2	0540	891	0.
1	0712	217	0.	*	1	1442	442	84.	*	1	2212	667	27.	*	2	0542	892	0.
1	0714	218	0.	*	1	1444	443	83.	*	1	2214	668	27.	*	2	0544	893	0.
1	0716	219	0.	*	1	1446	444	81.	*	1	2216	669	27.	*	2	0546	894	0.
1	0718	220	0.	*	1	1448	445	80.	*	1	2218	670	27.	*	2	0548	895	0.
1	0720	221	0.	*	1	1450	446	79.	*	1	2220	671	27.	*	2	0550	896	0.
1	0722	222	0.	*	1	1452	447	77.	*	1	2222	672	27.	*	2	0552	897	0.
1	0724	223	0.	*	1	1454	448	76.	*	1	2224	673	27.	*	2	0554	898	0.
1	0726	224	0.	*	1	1456	449	75.	*	1	2226	674	27.	*	2	0556	899	0.
1	0728	225	0.	*	1	1458	450	75.	*	1	2228	675	27.	*	2	0558	900	0.
				*					*					*				

****

PEAK FLOW (CFS)	TIME (HR)		MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	29.97-HR
+		(CFS)				
+ 801.	12.13		160.	51.	41.	41.
		(INCHES)	1.352	1.721	1.721	1.721
		(AC-FT)	79.	101.	101.	101.

CUMULATIVE AREA = 1.10 SQ MI

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1****************************************
*                                      *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *
*            JUN   1998                *
*          VERSION 4.1                 *
*                                      *
*  RUN DATE   13JAN00  TIME  08:15:49  *
*                                      *
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****************************************
*                                      *
*    U.S. ARMY CORPS OF ENGINEERS      *
*    HYDROLOGIC ENGINEERING CENTER     *
*          609 SECOND STREET           *
*       DAVIS, CALIFORNIA 95616        *
*           (916) 756-1104             *
*                                      *
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X     X  XXXXXXX   XXXXX          X
X     X  X        X     X        XX
X     X  X        X               X
XXXXXXX  XXXX     X        XXXXX  X
X     X  X        X               X
X     X  X        X     X         X
X     X  XXXXXXX   XXXXX         XXX
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THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL LOSS RATE:GREEN AND AMPT INFILTRATION
KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

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1                                          HEC-1 INPUT                                                    PAGE  1

LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

   1          ID   EXISTING LAND USE CALCULATIONS WERE BASED ON 1 YR. FROM 11/5/99
   2          ID   FOR LAS SENDAS, AND LANDISCOR JAN.1999 AERIAL PHOTOGPRAPHS
   3          ID
   4          ID   ALL DAMS WERE ANALYZED WITH NO STORAGE BELOW PRINCIPLE SPILLWAY ELEVATIONS
   5          ID
   6          ID   A CONSERVATIVE ESTIMATE WAS USED FOR THE LOCATION OF THE CENTROID FOR
   7          ID   PRECIPITATION VALUES
   8          ID
   9          ID   ALL CHANNEL ROUTING INFORMATION WAS OBTAINED FROM MCFCD SPOOK HILL, SIGNAL
  10          ID   BUTTE, AND BULLDOG FLOODWAY PLANS
  11          ID
  12          ID   ANALYSIS PREPARED BY WOOD/PATEL - JCD; 11/05/99; FILE: SPHEX2.DAT
  13          ID   DDM MCUHP1 SPOOK HILL AMDP - EXISTING CONDITIONS MODEL - 100YR, 24HR STORM
  14          ID
  15          ID   MODEL UPDATE WITH LAS SENDAS WEST BASINS & ALL RETENTION BASINS
  16          ID   DRAINING BACK INTO THE SYSTEM WITHIN 36 HOURS
  17          ID   BY: JCD; 1/4/2000            FILE: SPHEX2RV.DAT
  18          ID
              *DIAGRAM
  19          IT       2                    1500
  20          IO       3
  21          IN      15
  22          JD    3.81    0.01
  23          PC    .000    .002    .005    .008    .011    .014    .017    .020    .023    .026
  24          PC    .029    .032    .035    .038    .041    .044    .048    .052    .056    .060
  25          PC    .064    .068    .072    .076    .080    .085    .090    .095    .100    .105
  26          PC    .110    .115    .120    .126    .133    .140    .147    .155    .163    .172
  27          PC    .181    .191    .203    .218    .236    .257    .283    .387    .663    .707
  28          PC    .735    .758    .776    .791    .804    .815    .825    .834    .842    .849
  29          PC    .856    .863    .869    .875    .881    .887    .893    .898    .903    .908
  30          PC    .913    .918    .922    .926    .930    .934    .938    .942    .946    .950
  31          PC    .953    .956    .959    .962    .965    .968    .971    .974    .977    .980
  32          PC    .983    .986    .989    .992    .995    .998   1.000
  33          JD    3.58   10.00
  34          JD    3.43   30.00
  35          JD    3.28   60.00
  36          JD    3.22   90.00
  37          JD    3.18  120.00
  38          JD    3.14  150.00
  39          JD    3.05  300.00
  40          JD    2.97  500.00

  41          KK      20
  42          KM   SUB-BASIN 20
  43          KM   24-HOUR SCS TYPE II RAINFALL WAS USED TO FIND TC & R FOR THIS BASIN
  44          KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .989
  45          KM     L = 4.58  Kb = .037  Adj. Slope =  118.0
  46          BA   1.821
  47          LG    .350    .360   6.600    .140   7.000
  48          UC    .804    .697
1                                          HEC-1 INPUT                                                    PAGE  2

LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

  49          KK      40
  50          KM   SUB-BASIN 40
  51          KM   24-HOUR SCS TYPE II RAINFALL WAS USED TO FIND TC & R FOR THIS BASIN
  52          KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .987
  53          KM     L = 3.08  Kb = .036  Adj. Slope =  189.0
  54          BA   2.233
  55          LG    .340    .340   4.900    .280   5.000
  56          UC    .496    .264

  57          KK      60
  58          KM   SUB-BASIN 60
  59          KM   24-HOUR SCS TYPE II RAINFALL WAS USED TO FIND TC & R FOR THIS BASIN
  60          KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .990
  61          KM     L = 4.19  Kb = .038  Adj. Slope =  209.6
  62          BA   1.746
  63          LG    .330    .350   5.800    .190   9.000
  64          UC    .596    .477

  65          KK     60C
  66          KM   HYDROGRAPH COMBINATION FOR APACHE JUNCTION FRS
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INTERPOLATED HYDROGRAPH AT C119

DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW
1		0000	1	0.	1		1230	376	374.	2		0100	751	3.	2		1330	1126	2.
1		0002	2	0.	1		1232	377	351.	2		0102	752	3.	2		1332	1127	2.
1		0004	3	0.	1		1234	378	330.	2		0104	753	3.	2		1334	1128	2.
1		0006	4	0.	1		1236	379	312.	2		0106	754	3.	2		1336	1129	2.
1		0008	5	0.	1		1238	380	296.	2		0108	755	3.	2		1338	1130	2.
1		0010	6	0.	1		1240	381	281.	2		0110	756	3.	2		1340	1131	2.
1		0012	7	0.	1		1242	382	268.	2		0112	757	3.	2		1342	1132	2.
1		0014	8	0.	1		1244	383	256.	2		0114	758	3.	2		1344	1133	2.
1		0016	9	0.	1		1246	384	244.	2		0116	759	3.	2		1346	1134	2.
1		0018	10	0.	1		1248	385	232.	2		0118	760	3.	2		1348	1135	2.
1		0020	11	1.	1		1250	386	221.	2		0120	761	3.	2		1350	1136	2.
1		0022	12	1.	1		1252	387	209.	2		0122	762	3.	2		1352	1137	2.
1		0024	13	1.	1		1254	388	198.	2		0124	763	3.	2		1354	1138	2.
1		0026	14	1.	1		1256	389	188.	2		0126	764	3.	2		1356	1139	2.
1		0028	15	1.	1		1258	390	178.	2		0128	765	3.	2		1358	1140	2.
1		0030	16	1.	1		1300	391	169.	2		0130	766	3.	2		1400	1141	2.
1		0032	17	1.	1		1302	392	162.	2		0132	767	3.	2		1402	1142	2.
1		0034	18	1.	1		1304	393	154.	2		0134	768	3.	2		1404	1143	2.
1		0036	19	2.	1		1306	394	148.	2		0136	769	3.	2		1406	1144	2.
1		0038	20	2.	1		1308	395	141.	2		0138	770	3.	2		1408	1145	2.
1		0040	21	2.	1		1310	396	134.	2		0140	771	3.	2		1410	1146	2.
1		0042	22	2.	1		1312	397	127.	2		0142	772	3.	2		1412	1147	2.
1		0044	23	2.	1		1314	398	121.	2		0144	773	3.	2		1414	1148	2.
1		0046	24	2.	1		1316	399	115.	2		0146	774	2.	2		1416	1149	2.
1		0048	25	2.	1		1318	400	110.	2		0148	775	2.	2		1418	1150	2.
1		0050	26	2.	1		1320	401	105.	2		0150	776	2.	2		1420	1151	2.
1		0052	27	2.	1		1322	402	100.	2		0152	777	2.	2		1422	1152	2.
1		0054	28	2.	1		1324	403	96.	2		0154	778	2.	2		1424	1153	2.
1		0056	29	2.	1		1326	404	92.	2		0156	779	2.	2		1426	1154	2.
1		0058	30	2.	1		1328	405	88.	2		0158	780	2.	2		1428	1155	2.
1		0100	31	3.	1		1330	406	85.	2		0200	781	2.	2		1430	1156	2.
1		0102	32	3.	1		1332	407	82.	2		0202	782	2.	2		1432	1157	2.
1		0104	33	3.	1		1334	408	79.	2		0204	783	2.	2		1434	1158	2.
1		0106	34	3.	1		1336	409	76.	2		0206	784	2.	2		1436	1159	2.
1		0108	35	3.	1		1338	410	73.	2		0208	785	2.	2		1438	1160	2.
1		0110	36	3.	1		1340	411	71.	2		0210	786	2.	2		1440	1161	2.
1		0112	37	3.	1		1342	412	68.	2		0212	787	2.	2		1442	1162	2.
1		0114	38	3.	1		1344	413	66.	2		0214	788	2.	2		1444	1163	2.
1		0116	39	3.	1		1346	414	64.	2		0216	789	2.	2		1446	1164	2.
1		0118	40	3.	1		1348	415	62.	2		0218	790	2.	2		1448	1165	2.
1		0120	41	3.	1		1350	416	60.	2		0220	791	2.	2		1450	1166	2.
1		0122	42	3.	1		1352	417	58.	2		0222	792	2.	2		1452	1167	2.
1		0124	43	3.	1		1354	418	56.	2		0224	793	2.	2		1454	1168	2.
1		0126	44	3.	1		1356	419	55.	2		0226	794	2.	2		1456	1169	2.
1		0128	45	3.	1		1358	420	53.	2		0228	795	2.	2		1458	1170	2.
1		0130	46	3.	1		1400	421	51.	2		0230	796	2.	2		1500	1171	2.
1		0132	47	3.	1		1402	422	50.	2		0232	797	2.	2		1502	1172	2.
1		0134	48	3.	1		1404	423	48.	2		0234	798	2.	2		1504	1173	2.
1		0136	49	3.	1		1406	424	46.	2		0236	799	2.	2		1506	1174	2.
1		0138	50	3.	1		1408	425	45.	2		0238	800	2.	2		1508	1175	2.
1		0140	51	3.	1		1410	426	43.	2		0240	801	2.	2		1510	1176	2.
1		0142	52	3.	1		1412	427	42.	2		0242	802	2.	2		1512	1177	2.
1		0144	53	3.	1		1414	428	40.	2		0244	803	2.	2		1514	1178	2.
1		0146	54	3.	1		1416	429	39.	2		0246	804	2.	2		1516	1179	2.
1		0148	55	3.	1		1418	430	38.	2		0248	805	2.	2		1518	1180	2.
1		0150	56	3.	1		1420	431	37.	2		0250	806	2.	2		1520	1181	2.
1		0152	57	3.	1		1422	432	36.	2		0252	807	2.	2		1522	1182	2.
1		0154	58	3.	1		1424	433	34.	2		0254	808	2.	2		1524	1183	2.
1		0156	59	3.	1		1426	434	33.	2		0256	809	2.	2		1526	1184	2.
1		0158	60	3.	1		1428	435	33.	2		0258	810	2.	2		1528	1185	2.
1		0200	61	3.	1		1430	436	32.	2		0300	811	2.	2		1530	1186	2.
1		0202	62	3.	1		1432	437	31.	2		0302	812	2.	2		1532	1187	2.
1		0204	63	3.	1		1434	438	30.	2		0304	813	2.	2		1534	1188	2.
1		0206	64	3.	1		1436	439	29.	2		0306	814	2.	2		1536	1189	2.
1		0208	65	3.	1		1438	440	28.	2		0308	815	2.	2		1538	1190	2.
1		0210	66	3.	1		1440	441	27.	2		0310	816	2.	2		1540	1191	2.
1		0212	67	3.	1		1442	442	27.	2		0312	817	2.	2		1542	1192	2.
1		0214	68	3.	1		1444	443	26.	2		0314	818	2.	2		1544	1193	2.
1		0216	69	3.	1		1446	444	25.	2		0316	819	2.	2		1546	1194	2.
1		0218	70	3.	1		1448	445	25.	2		0318	820	2.	2		1548	1195	2.
1		0220	71	3.	1		1450	446	24.	2		0320	821	2.	2		1550	1196	2.
1		0222	72	3.	1		1452	447	23.	2		0322	822	2.	2		1552	1197	2.
1		0224	73	3.	1		1454	448	23.	2		0324	823	2.	2		1554	1198	2.
1		0226	74	3.	1		1456	449	22.	2		0326	824	2.	2		1556	1199	2.
1		0228	75	3.	1		1458	450	22.	2		0328	825	2.	2		1558	1200	2.
1		0230	76	3.	1		1500	451	22.	2		0330	826	2.	2		1600	1201	2.
1		0232	77	3.	1		1502	452	21.	2		0332	827	2.	2		1602	1202	2.
1		0234	78	3.	1		1504	453	21.	2		0334	828	2.	2		1604	1203	2.
1		0236	79	3.	1		1506	454	20.	2		0336	829	2.	2		1606	1204	2.
1		0238	80	3.	1		1508	455	20.	2		0338	830	2.	2		1608	1205	2.
1		0240	81	3.	1		1510	456	19.	2		0340	831	2.	2		1610	1206	2.
1		0242	82	3.	1		1512	457	19.	2		0342	832	2.	2		1612	1207	2.
1		0244	83	3.	1		1514	458	19.	2		0344	833	2.	2		1614	1208	2.
1		0246	84	3.	1		1516	459	18.	2		0346	834	2.	2		1616	1209	2.
1		0248	85	3.	1		1518	460	18.	2		0348	835	2.	2		1618	1210	2.
1		0250	86	3.	1		1520	461	18.	2		0350	836	2.	2		1620	1211	2.
1		0252	87	3.	1		1522	462	18.	2		0352	837	2.	2		1622	1212	2.
1		0254	88	3.	1		1524	463	17.	2		0354	838	2.	2		1624	1213	2.
1		0256	89	3.	1		1526	464	17.	2		0356	839	2.	2		1626	1214	2.
1		0258	90	3.	1		1528	465	17.	2		0358	840	2.	2		1628	1215	2.
1		0300	91	3.	1		1530	466	16.	2		0400	841	2.	2		1630	1216	2.
1		0302	92	3.	1		1532	467	16.	2		0402	842	2.	2		1632	1217	2.
1		0304	93	3.	1		1534	468	16.	2		0404	843	2.	2		1634	1218	2.
1		0306	94	3.	1		1536	469	16.	2		0406	844	2.	2		1636	1219	2.
1		0308	95	3.	1		1538	470	15.	2		0408	845	2.	2		1638	1220	2.
1		0310	96	3.	1		1540	471	15.	2		0410	846	2.	2		1640	1221	2.
1		0312	97	3.	1		1542	472	15.	2		0412	847	2.	2		1642	1222	2.
1		0314	98	3.	1		1544	473	14.	2		0414	848	2.	2		1644	1223	2.
1		0316	99	3.	1		1546	474	14.	2		0416	849	2.	2		1646	1224	2.
1		0318	100	3.	1		1548	475	14.	2		0418	850	2.	2		1648	1225	2.
1		0320	101	3.	1		1550	476	14.	2		0420	851	2.	2		1650	1226	2.
1		0322	102	3.	1		1552	477	14.	2		0422	852	2.	2		1652	1227	2.
1		0324	103	3.	1		1554	478	13.	2		0424	853	2.	2		1654	1228	2.
1		0326	104	3.	1		1556	479	13.	2		0426	854	2.	2		1656	1229	2.
1		0328	105	3.	1		1558	480	13.	2		0428	855	2.	2		1658	1230	2.

1	0330	106	3.	*	1	1600	481	13.	*	2	0430	856	2.	*	2	1700	1231	2.
1	0332	107	3.	*	1	1602	482	13.	*	2	0432	857	2.	*	2	1702	1232	2.
1	0334	108	3.	*	1	1604	483	12.	*	2	0434	858	2.	*	2	1704	1233	2.
1	0336	109	3.	*	1	1606	484	12.	*	2	0436	859	2.	*	2	1706	1234	2.
1	0338	110	3.	*	1	1608	485	12.	*	2	0438	860	2.	*	2	1708	1235	2.
1	0340	111	3.	*	1	1610	486	12.	*	2	0440	861	2.	*	2	1710	1236	2.
1	0342	112	3.	*	1	1612	487	12.	*	2	0442	862	2.	*	2	1712	1237	2.
1	0344	113	3.	*	1	1614	488	12.	*	2	0444	863	2.	*	2	1714	1238	2.
1	0346	114	3.	*	1	1616	489	12.	*	2	0446	864	2.	*	2	1716	1239	2.
1	0348	115	3.	*	1	1618	490	11.	*	2	0448	865	2.	*	2	1718	1240	2.
1	0350	116	3.	*	1	1620	491	11.	*	2	0450	866	2.	*	2	1720	1241	2.
1	0352	117	3.	*	1	1622	492	11.	*	2	0452	867	2.	*	2	1722	1242	2.
1	0354	118	3.	*	1	1624	493	11.	*	2	0454	868	2.	*	2	1724	1243	2.
1	0356	119	3.	*	1	1626	494	11.	*	2	0456	869	2.	*	2	1726	1244	2.
1	0358	120	3.	*	1	1628	495	11.	*	2	0458	870	2.	*	2	1728	1245	2.
1	0400	121	3.	*	1	1630	496	11.	*	2	0500	871	2.	*	2	1730	1246	2.
1	0402	122	3.	*	1	1632	497	11.	*	2	0502	872	2.	*	2	1732	1247	2.
1	0404	123	3.	*	1	1634	498	11.	*	2	0504	873	2.	*	2	1734	1248	2.
1	0406	124	4.	*	1	1636	499	11.	*	2	0506	874	2.	*	2	1736	1249	2.
1	0408	125	4.	*	1	1638	500	11.	*	2	0508	875	2.	*	2	1738	1250	2.
1	0410	126	4.	*	1	1640	501	10.	*	2	0510	876	2.	*	2	1740	1251	2.
1	0412	127	4.	*	1	1642	502	10.	*	2	0512	877	2.	*	2	1742	1252	2.
1	0414	128	4.	*	1	1644	503	10.	*	2	0514	878	2.	*	2	1744	1253	2.
1	0416	129	4.	*	1	1646	504	10.	*	2	0516	879	2.	*	2	1746	1254	2.
1	0418	130	4.	*	1	1648	505	10.	*	2	0518	880	2.	*	2	1748	1255	2.
1	0420	131	4.	*	1	1650	506	10.	*	2	0520	881	2.	*	2	1750	1256	2.
1	0422	132	4.	*	1	1652	507	10.	*	2	0522	882	2.	*	2	1752	1257	2.
1	0424	133	4.	*	1	1654	508	10.	*	2	0524	883	2.	*	2	1754	1258	2.
1	0426	134	4.	*	1	1656	509	10.	*	2	0526	884	2.	*	2	1756	1259	2.
1	0428	135	4.	*	1	1658	510	9.	*	2	0528	885	2.	*	2	1758	1260	2.
1	0430	136	4.	*	1	1700	511	9.	*	2	0530	886	2.	*	2	1800	1261	2.
1	0432	137	4.	*	1	1702	512	9.	*	2	0532	887	2.	*	2	1802	1262	2.
1	0434	138	4.	*	1	1704	513	9.	*	2	0534	888	2.	*	2	1804	1263	2.
1	0436	139	4.	*	1	1706	514	9.	*	2	0536	889	2.	*	2	1806	1264	2.
1	0438	140	4.	*	1	1708	515	9.	*	2	0538	890	2.	*	2	1808	1265	2.
1	0440	141	4.	*	1	1710	516	9.	*	2	0540	891	2.	*	2	1810	1266	2.
1	0442	142	4.	*	1	1712	517	9.	*	2	0542	892	2.	*	2	1812	1267	2.
1	0444	143	4.	*	1	1714	518	9.	*	2	0544	893	2.	*	2	1814	1268	2.
1	0446	144	4.	*	1	1716	519	9.	*	2	0546	894	2.	*	2	1816	1269	2.
1	0448	145	4.	*	1	1718	520	9.	*	2	0548	895	2.	*	2	1818	1270	2.
1	0450	146	4.	*	1	1720	521	9.	*	2	0550	896	2.	*	2	1820	1271	2.
1	0452	147	4.	*	1	1722	522	9.	*	2	0552	897	2.	*	2	1822	1272	2.
1	0454	148	4.	*	1	1724	523	9.	*	2	0554	898	2.	*	2	1824	1273	2.
1	0456	149	4.	*	1	1726	524	9.	*	2	0556	899	2.	*	2	1826	1274	2.
1	0458	150	4.	*	1	1728	525	9.	*	2	0558	900	2.	*	2	1828	1275	2.
1	0500	151	4.	*	1	1730	526	9.	*	2	0600	901	2.	*	2	1830	1276	2.
1	0502	152	4.	*	1	1732	527	8.	*	2	0602	902	2.	*	2	1832	1277	2.
1	0504	153	4.	*	1	1734	528	8.	*	2	0604	903	2.	*	2	1834	1278	2.
1	0506	154	4.	*	1	1736	529	8.	*	2	0606	904	2.	*	2	1836	1279	2.
1	0508	155	4.	*	1	1738	530	8.	*	2	0608	905	2.	*	2	1838	1280	2.
1	0510	156	4.	*	1	1740	531	8.	*	2	0610	906	2.	*	2	1840	1281	2.
1	0512	157	4.	*	1	1742	532	8.	*	2	0612	907	2.	*	2	1842	1282	2.
1	0514	158	4.	*	1	1744	533	8.	*	2	0614	908	2.	*	2	1844	1283	2.
1	0516	159	4.	*	1	1746	534	8.	*	2	0616	909	2.	*	2	1846	1284	2.
1	0518	160	4.	*	1	1748	535	8.	*	2	0618	910	2.	*	2	1848	1285	2.
1	0520	161	4.	*	1	1750	536	8.	*	2	0620	911	2.	*	2	1850	1286	2.
1	0522	162	4.	*	1	1752	537	8.	*	2	0622	912	2.	*	2	1852	1287	2.
1	0524	163	4.	*	1	1754	538	8.	*	2	0624	913	2.	*	2	1854	1288	2.
1	0526	164	4.	*	1	1756	539	8.	*	2	0626	914	2.	*	2	1856	1289	2.
1	0528	165	4.	*	1	1758	540	8.	*	2	0628	915	2.	*	2	1858	1290	2.
1	0530	166	4.	*	1	1800	541	8.	*	2	0630	916	2.	*	2	1900	1291	2.
1	0532	167	4.	*	1	1802	542	8.	*	2	0632	917	2.	*	2	1902	1292	2.
1	0534	168	4.	*	1	1804	543	8.	*	2	0634	918	2.	*	2	1904	1293	2.
1	0536	169	4.	*	1	1806	544	8.	*	2	0636	919	2.	*	2	1906	1294	2.
1	0538	170	4.	*	1	1808	545	8.	*	2	0638	920	2.	*	2	1908	1295	2.
1	0540	171	4.	*	1	1810	546	8.	*	2	0640	921	2.	*	2	1910	1296	2.
1	0542	172	4.	*	1	1812	547	8.	*	2	0642	922	2.	*	2	1912	1297	2.
1	0544	173	4.	*	1	1814	548	8.	*	2	0644	923	2.	*	2	1914	1298	2.
1	0546	174	4.	*	1	1816	549	7.	*	2	0646	924	2.	*	2	1916	1299	2.
1	0548	175	4.	*	1	1818	550	7.	*	2	0648	925	2.	*	2	1918	1300	2.
1	0550	176	4.	*	1	1820	551	7.	*	2	0650	926	2.	*	2	1920	1301	2.
1	0552	177	4.	*	1	1822	552	7.	*	2	0652	927	2.	*	2	1922	1302	2.
1	0554	178	4.	*	1	1824	553	7.	*	2	0654	928	2.	*	2	1924	1303	2.
1	0556	179	4.	*	1	1826	554	7.	*	2	0656	929	2.	*	2	1926	1304	2.
1	0558	180	4.	*	1	1828	555	7.	*	2	0658	930	2.	*	2	1928	1305	2.
1	0600	181	4.	*	1	1830	556	7.	*	2	0700	931	2.	*	2	1930	1306	2.
1	0602	182	4.	*	1	1832	557	7.	*	2	0702	932	2.	*	2	1932	1307	2.
1	0604	183	4.	*	1	1834	558	7.	*	2	0704	933	2.	*	2	1934	1308	2.
1	0606	184	4.	*	1	1836	559	7.	*	2	0706	934	2.	*	2	1936	1309	2.
1	0608	185	4.	*	1	1838	560	7.	*	2	0708	935	2.	*	2	1938	1310	2.
1	0610	186	4.	*	1	1840	561	7.	*	2	0710	936	2.	*	2	1940	1311	2.
1	0612	187	4.	*	1	1842	562	7.	*	2	0712	937	2.	*	2	1942	1312	2.
1	0614	188	4.	*	1	1844	563	7.	*	2	0714	938	2.	*	2	1944	1313	2.
1	0616	189	4.	*	1	1846	564	7.	*	2	0716	939	2.	*	2	1946	1314	2.
1	0618	190	5.	*	1	1848	565	7.	*	2	0718	940	2.	*	2	1948	1315	2.
1	0620	191	5.	*	1	1850	566	7.	*	2	0720	941	2.	*	2	1950	1316	2.
1	0622	192	5.	*	1	1852	567	7.	*	2	0722	942	2.	*	2	1952	1317	2.
1	0624	193	5.	*	1	1854	568	7.	*	2	0724	943	2.	*	2	1954	1318	2.
1	0626	194	5.	*	1	1856	569	7.	*	2	0726	944	2.	*	2	1956	1319	2.
1	0628	195	5.	*	1	1858	570	7.	*	2	0728	945	2.	*	2	1958	1320	2.
1	0630	196	5.	*	1	1900	571	7.	*	2	0730	946	2.	*	2	2000	1321	2.
1	0632	197	5.	*	1	1902	572	7.	*	2	0732	947	2.	*	2	2002	1322	2.
1	0634	198	5.	*	1	1904	573	7.	*	2	0734	948	2.	*	2	2004	1323	2.
1	0636	199	5.	*	1	1906	574	7.	*	2	0736	949	2.	*	2	2006	1324	2.
1	0638	200	5.	*	1	1908	575	7.	*	2	0738	950	2.	*	2	2008	1325	2.
1	0640	201	5.	*	1	1910	576	7.	*	2	0740	951	2.	*	2	2010	1326	2.
1	0642	202	5.	*	1	1912	577	7.	*	2	0742	952	2.	*	2	2012	1327	2.
1	0644	203	5.	*	1	1914	578	7.	*	2	0744	953	2.	*	2	2014	1328	2.
1	0646	204	5.	*	1	1916	579	7.	*	2	0746	954	2.	*	2	2016	1329	2.
1	0648	205	5.	*	1	1918	580	7.	*	2	0748	955	2.	*	2	2018	1330	2.
1	0650	206	5.	*	1	1920	581	7.	*	2	0750	956	2.	*	2	2020	1331	2.
1	0652	207	5.	*	1	1922	582	7.	*	2	0752	957	2.	*	2	2022	1332	2.
1	0654	208	5.	*	1	1924	583	7.	*	2	0754	958	2.	*	2	2024	1333	2.
1	0656	209	5.	*	1	1926	584	7.	*	2	0756	959	2.	*	2	2026	1334	2.
1	0658	210	5.	*	1	1928	585	7.	*	2	0758	960	2.	*	2	2028	1335	2.
1	0700	211	5.	*	1	1930	586	7.	*	2	0800	961	2.	*	2	2030	1336	2.
1	0702	212	5.	*	1	1932	587	7.	*	2	0802	962	2.	*	2	2032	1337	2.
1	0704	213	5.	*	1	1934	588	7.	*	2	0804	963	2.	*	2	2034	1338	2.
1	0706	214	5.	*	1	1936	589	7.	*	2	0806	964	2.	*	2	2036	1339	2.
1	0708	215	5.	*	1	1938	590	7.	*	2	0808	965	2.	*	2	2038	1340	2.
1	0710	216	5.	*	1	1940	591	7.	*	2	0810	966	2.	*	2	2040	1341	2.
1	0712	217	5.	*	1	1942	592	7.	*	2	0812	967	2.	*	2	2042	1342	2.
1	0714	218	5.	*	1	1944	593	7.	*	2	0814	968	2.	*	2	2044	1343	2.

1	0716	219	5.	*	1	1946	594	7.	*	2	0816	969	2.	*	2	2046	1344	2.
1	0718	220	5.	*	1	1948	595	7.	*	2	0818	970	2.	*	2	2048	1345	1.
1	0720	221	5.	*	1	1950	596	7.	*	2	0820	971	2.	*	2	2050	1346	1.
1	0722	222	5.	*	1	1952	597	7.	*	2	0822	972	2.	*	2	2052	1347	1.
1	0724	223	5.	*	1	1954	598	7.	*	2	0824	973	2.	*	2	2054	1348	1.
1	0726	224	5.	*	1	1956	599	7.	*	2	0826	974	2.	*	2	2056	1349	1.
1	0728	225	5.	*	1	1958	600	7.	*	2	0828	975	2.	*	2	2058	1350	1.
1	0730	226	5.	*	1	2000	601	7.	*	2	0830	976	2.	*	2	2100	1351	1.
1	0732	227	5.	*	1	2002	602	7.	*	2	0832	977	2.	*	2	2102	1352	1.
1	0734	228	5.	*	1	2004	603	6.	*	2	0834	978	2.	*	2	2104	1353	1.
1	0736	229	5.	*	1	2006	604	6.	*	2	0836	979	2.	*	2	2106	1354	1.
1	0738	230	5.	*	1	2008	605	6.	*	2	0838	980	2.	*	2	2108	1355	1.
1	0740	231	5.	*	1	2010	606	6.	*	2	0840	981	2.	*	2	2110	1356	1.
1	0742	232	5.	*	1	2012	607	6.	*	2	0842	982	2.	*	2	2112	1357	1.
1	0744	233	5.	*	1	2014	608	6.	*	2	0844	983	2.	*	2	2114	1358	1.
1	0746	234	5.	*	1	2016	609	6.	*	2	0846	984	2.	*	2	2116	1359	1.
1	0748	235	5.	*	1	2018	610	6.	*	2	0848	985	2.	*	2	2118	1360	1.
1	0750	236	5.	*	1	2020	611	6.	*	2	0850	986	2.	*	2	2120	1361	1.
1	0752	237	5.	*	1	2022	612	6.	*	2	0852	987	2.	*	2	2122	1362	1.
1	0754	238	5.	*	1	2024	613	6.	*	2	0854	988	2.	*	2	2124	1363	1.
1	0756	239	5.	*	1	2026	614	6.	*	2	0856	989	2.	*	2	2126	1364	1.
1	0758	240	5.	*	1	2028	615	6.	*	2	0858	990	2.	*	2	2128	1365	1.
1	0800	241	5.	*	1	2030	616	6.	*	2	0900	991	2.	*	2	2130	1366	1.
1	0802	242	5.	*	1	2032	617	6.	*	2	0902	992	2.	*	2	2132	1367	1.
1	0804	243	5.	*	1	2034	618	6.	*	2	0904	993	2.	*	2	2134	1368	1.
1	0806	244	5.	*	1	2036	619	6.	*	2	0906	994	2.	*	2	2136	1369	1.
1	0808	245	5.	*	1	2038	620	6.	*	2	0908	995	2.	*	2	2138	1370	1.
1	0810	246	5.	*	1	2040	621	6.	*	2	0910	996	2.	*	2	2140	1371	1.
1	0812	247	5.	*	1	2042	622	6.	*	2	0912	997	2.	*	2	2142	1372	1.
1	0814	248	5.	*	1	2044	623	6.	*	2	0914	998	2.	*	2	2144	1373	1.
1	0816	249	6.	*	1	2046	624	6.	*	2	0916	999	2.	*	2	2146	1374	1.
1	0818	250	6.	*	1	2048	625	6.	*	2	0918	1000	2.	*	2	2148	1375	1.
1	0820	251	6.	*	1	2050	626	6.	*	2	0920	1001	2.	*	2	2150	1376	1.
1	0822	252	6.	*	1	2052	627	6.	*	2	0922	1002	2.	*	2	2152	1377	1.
1	0824	253	6.	*	1	2054	628	6.	*	2	0924	1003	2.	*	2	2154	1378	1.
1	0826	254	6.	*	1	2056	629	6.	*	2	0926	1004	2.	*	2	2156	1379	1.
1	0828	255	6.	*	1	2058	630	6.	*	2	0928	1005	2.	*	2	2158	1380	1.
1	0830	256	6.	*	1	2100	631	6.	*	2	0930	1006	2.	*	2	2200	1381	1.
1	0832	257	6.	*	1	2102	632	6.	*	2	0932	1007	2.	*	2	2202	1382	1.
1	0834	258	6.	*	1	2104	633	6.	*	2	0934	1008	2.	*	2	2204	1383	1.
1	0836	259	6.	*	1	2106	634	6.	*	2	0936	1009	2.	*	2	2206	1384	1.
1	0838	260	6.	*	1	2108	635	6.	*	2	0938	1010	2.	*	2	2208	1385	1.
1	0840	261	6.	*	1	2110	636	6.	*	2	0940	1011	2.	*	2	2210	1386	1.
1	0842	262	7.	*	1	2112	637	6.	*	2	0942	1012	2.	*	2	2212	1387	1.
1	0844	263	7.	*	1	2114	638	6.	*	2	0944	1013	2.	*	2	2214	1388	1.
1	0846	264	7.	*	1	2116	639	6.	*	2	0946	1014	2.	*	2	2216	1389	1.
1	0848	265	7.	*	1	2118	640	6.	*	2	0948	1015	2.	*	2	2218	1390	1.
1	0850	266	7.	*	1	2120	641	6.	*	2	0950	1016	2.	*	2	2220	1391	1.
1	0852	267	7.	*	1	2122	642	6.	*	2	0952	1017	2.	*	2	2222	1392	1.
1	0854	268	7.	*	1	2124	643	6.	*	2	0954	1018	2.	*	2	2224	1393	1.
1	0856	269	7.	*	1	2126	644	6.	*	2	0956	1019	2.	*	2	2226	1394	1.
1	0858	270	7.	*	1	2128	645	6.	*	2	0958	1020	2.	*	2	2228	1395	1.
1	0900	271	7.	*	1	2130	646	6.	*	2	1000	1021	2.	*	2	2230	1396	1.
1	0902	272	7.	*	1	2132	647	6.	*	2	1002	1022	2.	*	2	2232	1397	1.
1	0904	273	7.	*	1	2134	648	6.	*	2	1004	1023	2.	*	2	2234	1398	1.
1	0906	274	7.	*	1	2136	649	6.	*	2	1006	1024	2.	*	2	2236	1399	1.
1	0908	275	7.	*	1	2138	650	6.	*	2	1008	1025	2.	*	2	2238	1400	1.
1	0910	276	7.	*	1	2140	651	6.	*	2	1010	1026	2.	*	2	2240	1401	1.
1	0912	277	7.	*	1	2142	652	6.	*	2	1012	1027	2.	*	2	2242	1402	1.
1	0914	278	7.	*	1	2144	653	6.	*	2	1014	1028	2.	*	2	2244	1403	1.
1	0916	279	7.	*	1	2146	654	6.	*	2	1016	1029	2.	*	2	2246	1404	1.
1	0918	280	7.	*	1	2148	655	6.	*	2	1018	1030	2.	*	2	2248	1405	1.
1	0920	281	8.	*	1	2150	656	6.	*	2	1020	1031	2.	*	2	2250	1406	1.
1	0922	282	8.	*	1	2152	657	6.	*	2	1022	1032	2.	*	2	2252	1407	1.
1	0924	283	8.	*	1	2154	658	6.	*	2	1024	1033	2.	*	2	2254	1408	1.
1	0926	284	8.	*	1	2156	659	6.	*	2	1026	1034	2.	*	2	2256	1409	1.
1	0928	285	8.	*	1	2158	660	6.	*	2	1028	1035	2.	*	2	2258	1410	1.
1	0930	286	8.	*	1	2200	661	6.	*	2	1030	1036	2.	*	2	2300	1411	1.
1	0932	287	8.	*	1	2202	662	6.	*	2	1032	1037	2.	*	2	2302	1412	1.
1	0934	288	8.	*	1	2204	663	6.	*	2	1034	1038	2.	*	2	2304	1413	1.
1	0936	289	8.	*	1	2206	664	6.	*	2	1036	1039	2.	*	2	2306	1414	1.
1	0938	290	8.	*	1	2208	665	6.	*	2	1038	1040	2.	*	2	2308	1415	1.
1	0940	291	8.	*	1	2210	666	6.	*	2	1040	1041	2.	*	2	2310	1416	1.
1	0942	292	8.	*	1	2212	667	6.	*	2	1042	1042	2.	*	2	2312	1417	1.
1	0944	293	8.	*	1	2214	668	6.	*	2	1044	1043	2.	*	2	2314	1418	1.
1	0946	294	8.	*	1	2216	669	6.	*	2	1046	1044	2.	*	2	2316	1419	1.
1	0948	295	8.	*	1	2218	670	6.	*	2	1048	1045	2.	*	2	2318	1420	1.
1	0950	296	8.	*	1	2220	671	6.	*	2	1050	1046	2.	*	2	2320	1421	1.
1	0952	297	9.	*	1	2222	672	6.	*	2	1052	1047	2.	*	2	2322	1422	1.
1	0954	298	9.	*	1	2224	673	6.	*	2	1054	1048	2.	*	2	2324	1423	1.
1	0956	299	9.	*	1	2226	674	6.	*	2	1056	1049	2.	*	2	2326	1424	1.
1	0958	300	9.	*	1	2228	675	6.	*	2	1058	1050	2.	*	2	2328	1425	1.
1	1000	301	9.	*	1	2230	676	6.	*	2	1100	1051	2.	*	2	2330	1426	1.
1	1002	302	9.	*	1	2232	677	6.	*	2	1102	1052	2.	*	2	2332	1427	1.
1	1004	303	9.	*	1	2234	678	6.	*	2	1104	1053	2.	*	2	2334	1428	1.
1	1006	304	9.	*	1	2236	679	6.	*	2	1106	1054	2.	*	2	2336	1429	1.
1	1008	305	9.	*	1	2238	680	6.	*	2	1108	1055	2.	*	2	2338	1430	1.
1	1010	306	9.	*	1	2240	681	6.	*	2	1110	1056	2.	*	2	2340	1431	1.
1	1012	307	9.	*	1	2242	682	6.	*	2	1112	1057	2.	*	2	2342	1432	1.
1	1014	308	9.	*	1	2244	683	6.	*	2	1114	1058	2.	*	2	2344	1433	1.
1	1016	309	9.	*	1	2246	684	6.	*	2	1116	1059	2.	*	2	2346	1434	1.
1	1018	310	9.	*	1	2248	685	6.	*	2	1118	1060	2.	*	2	2348	1435	1.
1	1020	311	10.	*	1	2250	686	6.	*	2	1120	1061	2.	*	2	2350	1436	1.
1	1022	312	10.	*	1	2252	687	6.	*	2	1122	1062	2.	*	2	2352	1437	1.
1	1024	313	10.	*	1	2254	688	6.	*	2	1124	1063	2.	*	2	2354	1438	1.
1	1026	314	10.	*	1	2256	689	6.	*	2	1126	1064	2.	*	2	2356	1439	1.
1	1028	315	10.	*	1	2258	690	6.	*	2	1128	1065	2.	*	2	2358	1440	1.
1	1030	316	10.	*	1	2300	691	6.	*	2	1130	1066	2.	*	3	0000	1441	1.
1	1032	317	10.	*	1	2302	692	6.	*	2	1132	1067	2.	*	3	0002	1442	1.
1	1034	318	10.	*	1	2304	693	6.	*	2	1134	1068	2.	*	3	0004	1443	1.
1	1036	319	11.	*	1	2306	694	6.	*	2	1136	1069	2.	*	3	0006	1444	1.
1	1038	320	11.	*	1	2308	695	6.	*	2	1138	1070	2.	*	3	0008	1445	1.
1	1040	321	11.	*	1	2310	696	6.	*	2	1140	1071	2.	*	3	0010	1446	1.
1	1042	322	11.	*	1	2312	697	6.	*	2	1142	1072	2.	*	3	0012	1447	1.
1	1044	323	12.	*	1	2314	698	6.	*	2	1144	1073	2.	*	3	0014	1448	1.
1	1046	324	12.	*	1	2316	699	6.	*	2	1146	1074	2.	*	3	0016	1449	1.
1	1048	325	12.	*	1	2318	700	6.	*	2	1148	1075	2.	*	3	0018	1450	1.
1	1050	326	12.	*	1	2320	701	6.	*	2	1150	1076	2.	*	3	0020	1451	1.
1	1052	327	13.	*	1	2322	702	6.	*	2	1152	1077	2.	*	3	0022	1452	1.
1	1054	328	13.	*	1	2324	703	6.	*	2	1154	1078	2.	*	3	0024	1453	1.
1	1056	329	13.	*	1	2326	704	6.	*	2	1156	1079	2.	*	3	0026	1454	1.
1	1058	330	14.	*	1	2328	705	6.	*	2	1158	1080	2.	*	3	0028	1455	1.
1	1100	331	14.	*	1	2330	706	6.	*	2	1200	1081	2.	*	3	0030	1456	1.

1	1102	332	14.	*	1	2332	707	6.	*	2	1202	1082	2.	*	3	0032	1457	1.
1	1104	333	15.	*	1	2334	708	6.	*	2	1204	1083	2.	*	3	0034	1458	1.
1	1106	334	15.	*	1	2336	709	6.	*	2	1206	1084	2.	*	3	0036	1459	1.
1	1108	335	15.	*	1	2338	710	6.	*	2	1208	1085	2.	*	3	0038	1460	1.
1	1110	336	16.	*	1	2340	711	6.	*	2	1210	1086	2.	*	3	0040	1461	1.
1	1112	337	16.	*	1	2342	712	6.	*	2	1212	1087	2.	*	3	0042	1462	1.
1	1114	338	16.	*	1	2344	713	6.	*	2	1214	1088	2.	*	3	0044	1463	1.
1	1116	339	17.	*	1	2346	714	6.	*	2	1216	1089	2.	*	3	0046	1464	1.
1	1118	340	17.	*	1	2348	715	6.	*	2	1218	1090	2.	*	3	0048	1465	1.
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1	1138	350	24.	*	2	0008	725	5.	*	2	1238	1100	2.	*	3	0108	1475	1.
1	1140	351	27.	*	2	0010	726	5.	*	2	1240	1101	2.	*	3	0110	1476	1.
1	1142	352	33.	*	2	0012	727	5.	*	2	1242	1102	2.	*	3	0112	1477	1.
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1	1150	356	108.	*	2	0020	731	4.	*	2	1250	1106	2.	*	3	0120	1481	1.
1	1152	357	155.	*	2	0022	732	4.	*	2	1252	1107	2.	*	3	0122	1482	1.
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1	1200	361	492.	*	2	0030	736	4.	*	2	1300	1111	2.	*	3	0130	1486	1.
1	1202	362	595.	*	2	0032	737	4.	*	2	1302	1112	2.	*	3	0132	1487	1.
1	1204	363	681.	*	2	0034	738	4.	*	2	1304	1113	2.	*	3	0134	1488	1.
1	1206	364	739.	*	2	0036	739	3.	*	2	1306	1114	2.	*	3	0136	1489	1.
1	1208	365	762.	*	2	0038	740	3.	*	2	1308	1115	2.	*	3	0138	1490	1.
1	1210	366	750.	*	2	0040	741	3.	*	2	1310	1116	2.	*	3	0140	1491	1.
1	1212	367	714.	*	2	0042	742	3.	*	2	1312	1117	2.	*	3	0142	1492	1.
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1	1220	371	519.	*	2	0050	746	3.	*	2	1320	1121	2.	*	3	0150	1496	1.
1	1222	372	483.	*	2	0052	747	3.	*	2	1322	1122	2.	*	3	0152	1497	1.
1	1224	373	452.	*	2	0054	748	3.	*	2	1324	1123	2.	*	3	0154	1498	1.
1	1226	374	425.	*	2	0056	749	3.	*	2	1326	1124	2.	*	3	0156	1499	1.
1	1228	375	399.	*	2	0058	750	3.	*	2	1328	1125	2.	*	3	0158	1500	1.

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PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	49.97-HR
+ (CFS)	(HR)					
		(CFS)				
+ 762.	12.13		107.	31.	16.	16.
		(INCHES)	.905	1.047	1.116	1.116
		(AC-FT)	53.	61.	65.	65.

CUMULATIVE AREA = 1.10 SQ MI

STATION C119

(O) OUTFLOW

DAHRMN	PER	0.	100.	200.	300.	400.	500.	600.	700.	800.	0.	0.	0.	0.
10000	10													
10002	20													
10004	30													
10006	40													
10008	50													
10010	60													
10012	70													
10014	80													
10016	90													
10018	100													
10020	110													
10022	120													
10024	130													
10026	140													
10028	150													
10030	160													
10032	170													
10034	180													
10036	190													
10038	200													
10040	210													
10042	220													
10044	230													
10046	240													
10048	250													
10050	260													
10052	270													
10054	280													
10056	290													
10058	300													
10100	310													
10102	320													
10104	330													
10106	340													
10108	350													
10110	360													
10112	370													
10114	380													
10116	390													
10118	400													
10120	410													
10122	420													
10124	430													
10126	440													
10128	450													
10130	460													
10132	470													
10134	480													
10136	490													
10138	500													
10140	510													
10142	520													
10144	530													
10146	540													
10148	550													
10150	560													
10152	570													
10154	580													
10156	590													
10158	600													
10200	610													
10202	620													
10204	630													
10206	640													
10208	650													
10210	660													
10212	670													
10214	680													
10216	690													
10218	700													
10220	710													
10222	720													
10224	730													
10226	740													
10228	750													
10230	760													
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10234	780													
10236	790													
10238	800													
10240	810													
10242	820													
10244	830													
10246	840													
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10314	980													
10316	990													
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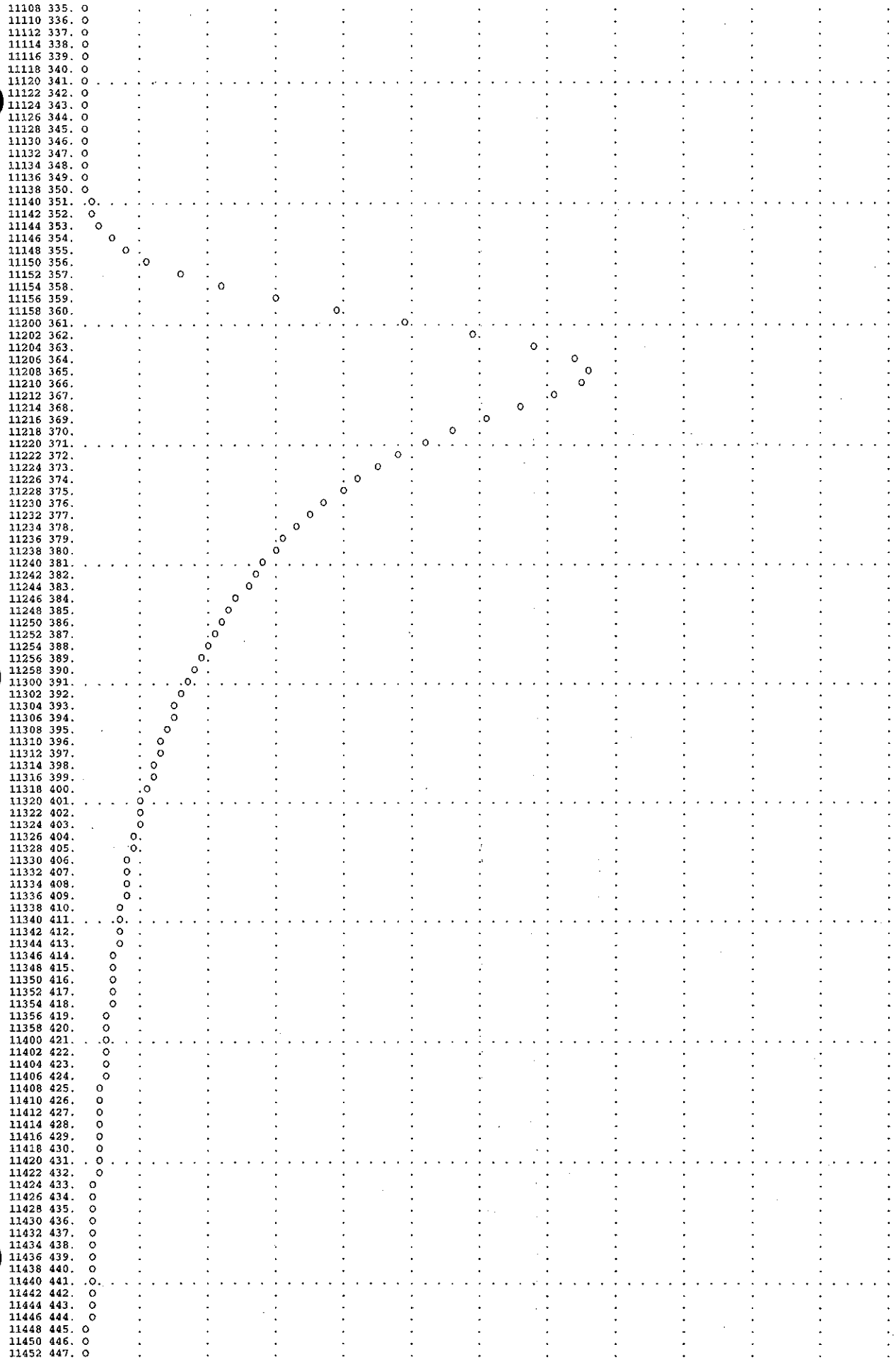
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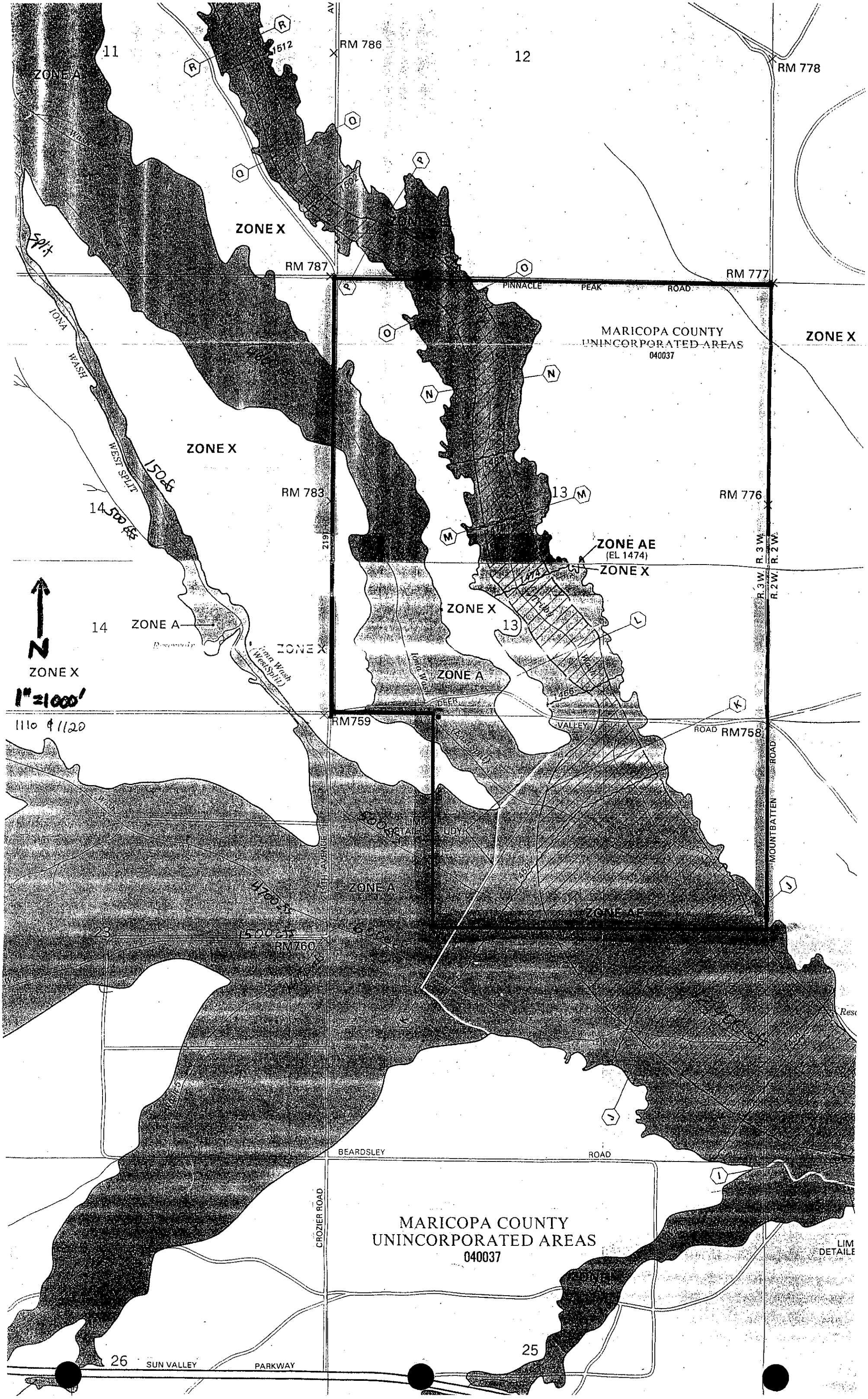
20106 7540
20108 7550
20110 7560
20112 7570
20114 7580
20116 7590
20118 7600
20120 7610
20122 7620
20124 7630
20126 7640
20128 7650
20130 7660
20132 7670
20134 7680
20136 7690
20138 7700
20140 7710
20142 7720
20144 7730
20146 7740
20148 7750
20150 7760
20152 7770
20154 7780
20156 7790
20158 7800
20200 7810
20202 7820
20204 7830
20206 7840
20208 7850
20210 7860


11
12
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ZONE A
ZONE X
ZONE AE
(EL 1474)
RM 786
RM 778
RM 787
RM 777
RM 783
RM 776
RM759
RM758
RM760
PINNACLE PEAK ROAD
MARICOPA COUNTY
UNINCORPORATED AREAS
040037
IONA WASH
WEST SPLIT
Iona Wash (West Split)
DEER VALLEY ROAD
MOUNTAIN ROAD
BEARDSLEY ROAD
CROZIER ROAD
SUN VALLEY PARKWAY
R. 3 W.
R. 2 W.
N
1"=1000'
1110 & 1120

SPOOK HILL ADMP UPDATE

Project Monthly Meeting
Thursday December 9, 1999, 9:00 AM at
Wood, Patel & Associates, Inc. (Wood/Patel)

Meeting Agenda

I. Attendees:

- Tim Phillips, FCDMC Project Manager — tsp@mail.maricopa.gov
- Afshin Ahouraiyan, FCDMC (Hydrology Div.) — afa@mail.maricopa.gov
- Ron Taylor, City of Mesa (Engineering) — ron_taylor@ci.mesa.az.us
- Ash Patel, Wood, Patel & Associates, Inc. — apatel@woodpatel.com
- Rick Hiner, Wood, Patel & Associates, Inc. — rhiner@woodpatel.com
- Jack Moody, Wood, Patel & Associates, Inc. — jmoody@woodpatel.com
- Joseph Daconta, Wood, Patel & Associates, Inc. — jdaconta@woodpatel.com
- Diane Simpson-Colebank, Logan Simpson Design, Inc. — dsimpson@lsdaz.com
- Ted Lehman, JE Fuller Hydrology & Geomorphology, Inc. — ted@jefuller.com

II. Hydrology:

- Current Status
- Level of Modeling Detail in Las Sendas Development

III. Public Involvement:

- Location/Time of Initial Public Meeting
- Location/Time of Stakeholder's Meeting
- Location/Time of Developer's Meeting
- Project Brochure
- Initial Newsletter
- Website

IV. Project Schedule:

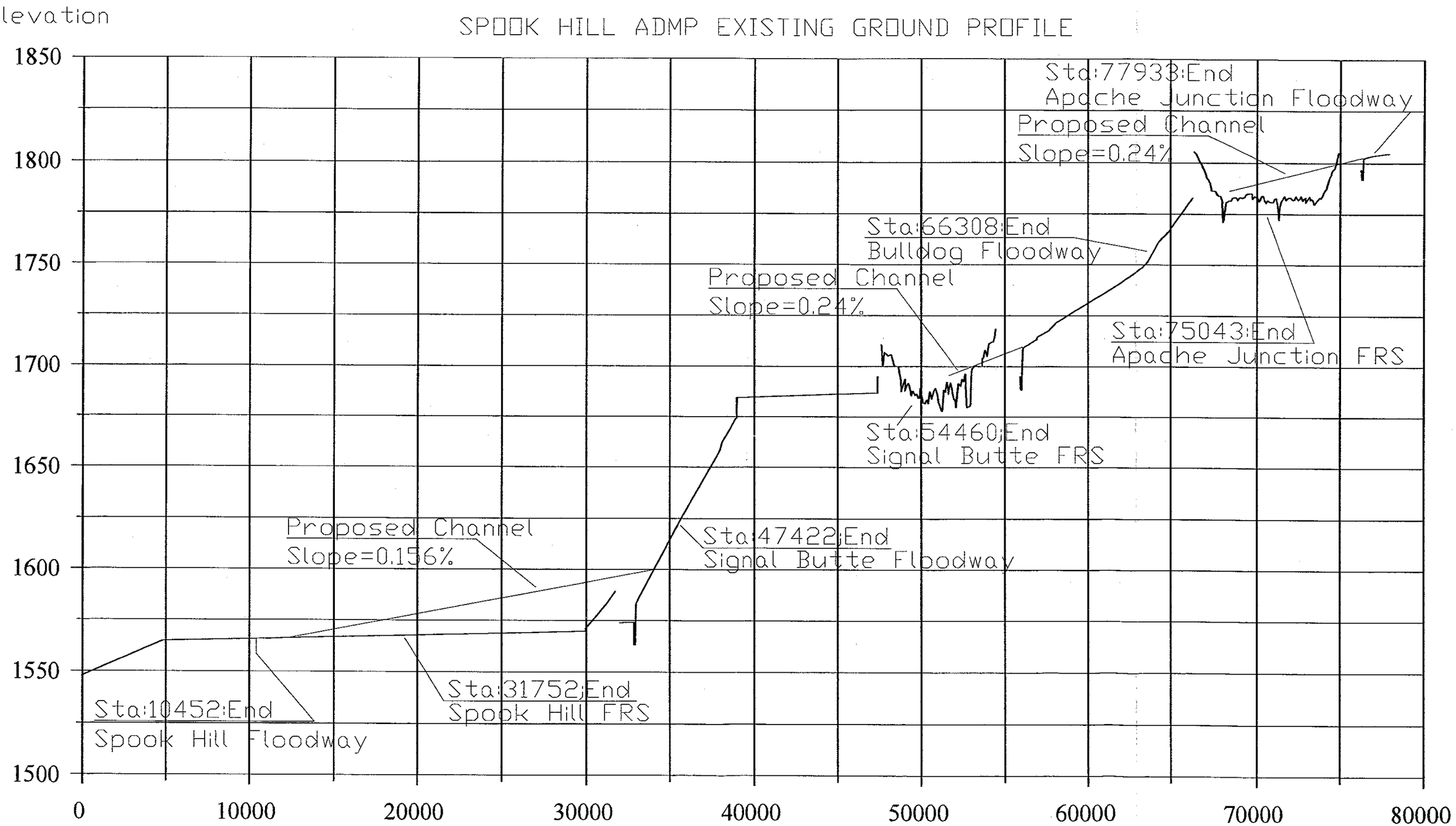
- Schedule of Meetings
- Scope Tasks Completed Since Last Monthly Meeting
- Scope Tasks to be Completed in the Next Month

V. Mapping:

- Mapping Contract Status
- Color Aerial Photo Availability

VI. Data Collection:

- Existing Mapping/Analysis at Signal Butte and Apache Junction.



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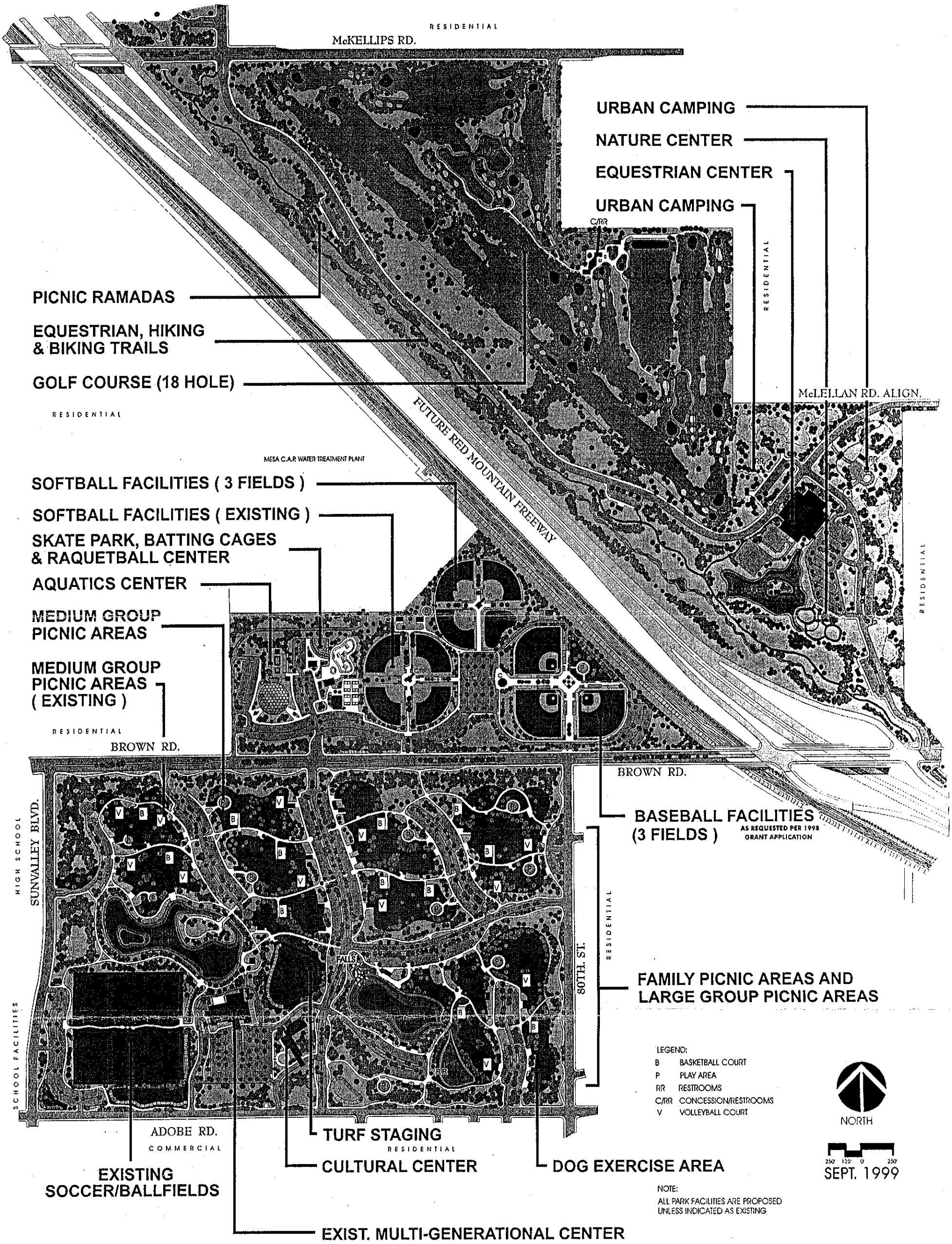
By: JCD; 11/22/99



RED MOUNTAIN PARK REVISED MASTER PLAN

REVISED 9-21-99 DLS

100-YR 24hr.

1

RUNOFF SUMMARY
FLOW IN CUBIC FEET PER SECOND
TIME IN HOURS, AREA IN SQUARE MILES

	OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
+	HYDROGRAPH AT	10	951.	12.27	114.	31.	15.	.70		
+	ROUTED TO	R10	826.	12.60	114.	31.	15.	.70		
+	HYDROGRAPH AT	20	959.	12.43	128.	32.	16.	1.12		
+	2 COMBINED AT	C20	1635.	12.53	240.	63.	30.	1.82	Apache Junction Floodway	
+	HYDROGRAPH AT	40	2582.	12.30	252.	66.	32.	2.23		
+	HYDROGRAPH AT	60	1553.	12.40	228.	61.	29.	1.75		
+	3 COMBINED AT	60C	5014.	12.37	708.	188.	90.	5.80		
+	ROUTED TO	SR60	92.	14.47	92.	89.	70.	5.80		
+	ROUTED TO	R60	92.	14.53	92.	89.	70.	5.80		
+	ROUTED TO	RR60	92.	14.63	92.	89.	70.	5.80		
+	HYDROGRAPH AT	80	1868.	12.27	179.	46.	22.	1.48		
+	2 COMBINED AT	80C	1942.	12.27	266.	134.	92.	1.48		
+	ROUTED TO	R80	1926.	12.27	266.	134.	92.	1.48		
+	HYDROGRAPH AT	100	404.	12.20	58.	15.	7.	.48		
+	2 COMBINED AT	100C	2306.	12.27	321.	148.	99.	1.96		
+	ROUTED TO	R100	2295.	12.30	321.	148.	99.	1.96		
+	HYDROGRAPH AT	120	3232.	12.27	326.	88.	42.	2.20		
+	2 COMBINED AT	120C	5474.	12.27	636.	229.	140.	4.16		
+	ROUTED TO	R120	5401.	12.30	636.	229.	140.	4.16	Bulldog Floodway	
+	HYDROGRAPH AT	140	632.	12.13	64.	17.	8.	.60		
+	HYDROGRAPH AT	150	135.	13.20	47.	13.	6.	.41		
+	ROUTED TO	R150	132.	13.67	47.	13.	6.	.41		
+	HYDROGRAPH AT	160	217.	12.40	35.	9.	4.	.37		
+	HYDROGRAPH AT	180	785.	12.37	90.	23.	11.	1.00		
+	5 COMBINED AT	180C	6710.	12.30	856.	286.	168.	6.54		
+	HYDROGRAPH AT	240	846.	12.33	107.	27.	13.	1.04		
+	ROUTED TO	R240	824.	12.40	107.	27.	13.	1.04		
+	HYDROGRAPH AT	210	1042.	12.17	134.	35.	17.	.58		
+	ROUTED TO	R210	968.	12.27	134.	35.	17.	.58		
+	HYDROGRAPH AT	220	1057.	12.17	93.	23.	11.	.69		
+	3 COMBINED AT	220C	2486.	12.27	329.	85.	41.	2.31		
+	ROUTED TO	R220	2433.	12.33	329.	85.	41.	2.31		
+	HYDROGRAPH AT	190	1403.	12.17	116.	31.	15.	.92		
+	ROUTED TO	R190	1272.	12.30	116.	31.	15.	.92		
+	HYDROGRAPH AT	200	1399.	12.17	115.	30.	15.	.92		

+	3 COMBINED AT	200C	4606.	12.27	551.	144.	69.	4.14
+	ROUTED TO	R200	4580.	12.30	551.	144.	69.	4.14
	2 COMBINED AT	C180	11154.	12.30	1387.	422.	235.	10.68
+	ROUTED TO	SR180	142.	17.27	142.	141.	116.	10.68
+	ROUTED TO	R180	142.	17.33	142.	141.	115.	10.68
+	HYDROGRAPH AT	260	418.	12.10	43.	12.	6.	.27
+	2 COMBINED AT	260C	529.	12.13	180.	152.	122.	.27
+	ROUTED TO	R260	511.	12.20	180.	152.	122.	.27
+	HYDROGRAPH AT	280	478.	12.10	42.	12.	6.	.30
+	2 COMBINED AT	280C	943.	12.13	219.	162.	127.	.57
+	ROUTED TO	R280	907.	12.20	219.	162.	127.	.57
+	HYDROGRAPH AT	300	875.	12.20	109.	29.	14.	.99
+	2 COMBINED AT	300C	1766.	12.20	325.	189.	140.	1.56
+	ROUTED TO	R300	1730.	12.27	325.	189.	140.	1.56
+	ROUTED TO	RR300	1697.	12.30	324.	189.	139.	1.56
+	HYDROGRAPH AT	350	1192.	12.20	103.	27.	13.	.97
+	DIVERSION TO	SF350	715.	12.20	62.	16.	8.	.97
+	HYDROGRAPH AT	D350	477.	12.20	41.	11.	5.	.97
+	ROUTED TO	350R	441.	12.37	41.	11.	5.	.97
+	HYDROGRAPH AT	310	376.	12.33	49.	12.	6.	.56
+	2 COMBINED AT	C310	812.	12.33	89.	23.	11.	.94
+	ROUTED TO	R310	730.	12.60	89.	23.	11.	.94
+	HYDROGRAPH AT	320	965.	12.20	123.	34.	17.	.97
+	DIVERSION TO	BS320	377.	11.97	21.	6.	3.	.97
+	HYDROGRAPH AT	D320	965.	12.20	109.	28.	14.	.97
+	HYDROGRAPH AT	RT320	377.	11.97	21.	6.	3.	.97
+	ROUTED TO	SR320	4.	4.13	4.	4.	3.	.97
+	4 COMBINED AT	C320	2532.	12.30	520.	242.	166.	3.47
+	HYDROGRAPH AT	340	1471.	12.17	186.	55.	26.	1.45
+	DIVERSION TO	BS340	1471.	12.17	104.	28.	14.	1.45
+	HYDROGRAPH AT	D340	1199.	12.33	97.	27.	13.	1.45
+	HYDROGRAPH AT	RT340	1471.	12.17	104.	28.	14.	1.45
+	ROUTED TO	SR340	19.	9.00	19.	19.	14.	1.45
+	3 COMBINED AT	C340	3691.	12.33	629.	286.	191.	4.92
+	HYDROGRAPH AT	RT350	715.	12.20	62.	16.	8.	.97
	ROUTED TO	RR350	659.	12.37	62.	16.	8.	.97
+	HYDROGRAPH AT	355	500.	12.33	69.	18.	9.	.66
+	2 COMBINED AT	C355	1144.	12.33	130.	34.	16.	1.24

Signal Butte Floodway

Signal Butte @ Spoothill FRS Floodway

+	ROUTED TO	R355	1036.	12.60	130.	34.	16.	1.24
+	HYDROGRAPH AT	370	588.	12.30	79.	21.	10.	.67
+	ROUTED TO	R370	524.	12.63	79.	21.	10.	.67
+	HYDROGRAPH AT	360	504.	12.23	84.	25.	12.	.67
+	DIVERSION TO	BS360	504.	12.23	53.	14.	7.	.67
+	HYDROGRAPH AT	D360	306.	12.63	38.	11.	5.	.67
+	HYDROGRAPH AT	RT360	504.	12.23	53.	14.	7.	.67
+	ROUTED TO	SR360	10.	9.83	10.	10.	7.	.67
+	5 COMBINED AT	360C	4448.	12.60	871.	356.	228.	7.50
+	HYDROGRAPH AT	395	182.	12.23	25.	7.	3.	.20
+	ROUTED TO	R395	157.	12.67	25.	7.	3.	.20
+	HYDROGRAPH AT	380	666.	12.27	98.	26.	13.	.97
+	DIVERSION TO	BS380	666.	12.27	56.	14.	7.	.97
+	HYDROGRAPH AT	D380	472.	12.57	46.	12.	6.	.97
+	HYDROGRAPH AT	RT380	666.	12.27	56.	14.	7.	.97
+	ROUTED TO	SR380	10.	11.33	10.	10.	7.	.97
+	4 COMBINED AT	380C	5004.	12.60	944.	383.	243.	8.67
+	HYDROGRAPH AT	390	463.	12.03	33.	10.	5.	.24
+	DIVERSION TO	BS390	95.	11.73	6.	2.	1.	.24
+	HYDROGRAPH AT	D390	463.	12.03	30.	8.	4.	.24
+	HYDROGRAPH AT	RT390	95.	11.73	6.	2.	1.	.24
+	ROUTED TO	SR390	1.	.90	1.	1.	1.	.24
+	2 COMBINED AT	390C	464.	12.03	31.	9.	5.	.24
+	ROUTED TO	RR390	367.	12.30	31.	9.	5.	.24
+	HYDROGRAPH AT	400	351.	12.23	47.	13.	6.	.62
+	3 COMBINED AT	400C	5319.	12.60	1016.	402.	253.	9.53
+	HYDROGRAPH AT	385	782.	12.23	87.	24.	12.	.65
+	DIVERSION TO	SF385	313.	12.23	35.	10.	5.	.65
+	HYDROGRAPH AT	D385	469.	12.23	52.	14.	7.	.65
+	ROUTED TO	385R	410.	12.50	52.	14.	7.	.65
+	HYDROGRAPH AT	420	752.	12.20	92.	26.	12.	.85
+	DIVERSION TO	BS420	269.	11.97	15.	4.	2.	.85
+	HYDROGRAPH AT	D420	752.	12.20	83.	22.	10.	.85
+	HYDROGRAPH AT	RT420	269.	11.97	15.	4.	2.	.85
+	ROUTED TO	SR420	13.	11.03	12.	4.	2.	.85
	4 COMBINED AT	420C	5986.	12.57	1146.	436.	271.	10.77
+	HYDROGRAPH AT	440	180.	12.03	12.	3.	2.	.08
+	ROUTED TO	R70	176.	12.07	12.	3.	2.	.08

+	HYDROGRAPH AT	441	16.	12.03	1.	0.	0.	.01
+	2 COMBINED AT	C108	191.	12.07	14.	4.	2.	.09
+	DIVERSION TO	SPLIT	96.	12.07	7.	2.	1.	.09
+	HYDROGRAPH AT	DIV4	96.	12.07	7.	2.	1.	.09
+	ROUTED TO	R108	88.	12.13	7.	2.	1.	.09
+	HYDROGRAPH AT	442	102.	12.10	9.	2.	1.	.10
+	2 COMBINED AT	C67	187.	12.10	15.	4.	2.	.19
+	DIVERSION TO	BASIN4	115.	12.10	6.	1.	1.	.19
+	HYDROGRAPH AT	DIV6	72.	12.10	10.	3.	1.	.19
+	HYDROGRAPH AT	RTDIV6	115.	12.10	6.	1.	1.	.19
+	ROUTED TO	RFDIV6	1.	11.90	1.	1.	1.	.19
+	2 COMBINED AT	CDIV6	74.	12.10	10.	4.	2.	.19
+	HYDROGRAPH AT	443	148.	12.07	14.	4.	2.	.08
+	DIVERSION TO	WSH66	78.	11.90	12.	3.	2.	.08
+	HYDROGRAPH AT	DIV66	70.	12.07	3.	1.	0.	.08
+	ROUTED TO	R113	69.	12.07	3.	1.	0.	.08
+	2 COMBINED AT	C114	140.	12.07	13.	4.	2.	.27
+	HYDROGRAPH AT	444	82.	12.03	5.	1.	1.	.04
+	ROUTED TO	R58	78.	12.07	5.	1.	1.	.04
+	HYDROGRAPH AT	445	296.	12.03	18.	5.	2.	.19
+	2 COMBINED AT	C107	368.	12.03	22.	6.	3.	.23
+	ROUTED TO	R107	368.	12.07	22.	6.	3.	.23
+	HYDROGRAPH AT	RTB2	96.	12.07	7.	2.	1.	.09
+	ROUTED TO	RSPLIT	95.	12.07	7.	2.	1.	.09
+	HYDROGRAPH AT	446	65.	12.03	6.	2.	1.	.04
+	3 COMBINED AT	C109	523.	12.07	35.	9.	4.	.27
+	DIVERSION TO	WSH404	35.	11.73	7.	2.	1.	.27
+	HYDROGRAPH AT	DIV5	488.	12.07	27.	7.	3.	.27
+	ROUTED TO	R109	472.	12.10	27.	7.	3.	.27
+	HYDROGRAPH AT	447	138.	12.07	12.	4.	2.	.09
+	HYDROGRAPH AT	RT404	35.	11.73	7.	2.	1.	.27
+	ROUTED TO	R404	35.	11.90	7.	2.	1.	.27
+	3 COMBINED AT	C110	637.	12.07	46.	13.	6.	.36
+	ROUTED TO	R110	635.	12.10	46.	13.	6.	.36
+	2 COMBINED AT	C115	767.	12.10	59.	17.	8.	.63
+	ROUTED TO	R115	770.	12.10	59.	17.	8.	.63
+	HYDROGRAPH AT	448	88.	12.03	6.	2.	1.	.05
+	HYDROGRAPH AT	449	80.	12.03	5.	1.	1.	.05

+ 2 COMBINED AT	C6364	166.	12.03	11.	3.	1.	.09
+ ROUTED TO	R6364	137.	12.17	11.	3.	1.	.09
+ HYDROGRAPH AT	450	61.	12.20	6.	2.	1.	.07
+ HYDROGRAPH AT	451	18.	12.17	2.	1.	0.	.03
+ HYDROGRAPH AT	RT66	78.	11.90	12.	3.	2.	.08
+ HYDROGRAPH AT	452	62.	12.03	4.	1.	1.	.04
+ 2 COMBINED AT	C6465	140.	12.03	16.	4.	2.	.04
+ ROUTED TO	R6566	135.	12.10	16.	4.	2.	.04
+ 4 COMBINED AT	C116	341.	12.17	35.	9.	4.	.23
+ ROUTED TO	BASIN5	152.	12.47	35.	9.	4.	.23
+ ROUTED TO	R116	150.	12.53	35.	9.	4.	.23
+ HYDROGRAPH AT	453	62.	12.10	7.	2.	1.	.06
+ 2 COMBINED AT	C117	169.	12.50	41.	11.	5.	.29
+ 2 COMBINED AT	C118	855.	12.10	99.	28.	14.	.92
+ ROUTED TO	R118	845.	12.10	99.	28.	14.	.92
+ DIVERSION TO	BASIN6	244.	12.10	10.	2.	1.	.92
+ HYDROGRAPH AT	DIV7	600.	12.10	89.	25.	13.	.92
+ HYDROGRAPH AT	RTDIV7	244.	12.10	10.	2.	1.	.92
+ ROUTED TO	RFDIV7	1.	11.97	1.	1.	1.	.92
+ 2 COMBINED AT	CDIV7	601.	12.10	90.	26.	13.	.92
+ HYDROGRAPH AT	454	157.	12.17	21.	6.	3.	.18
+ 2 COMBINED AT	C119	750.	12.13	110.	32.	16.	1.10
+ ROUTED TO	R454	682.	12.40	110.	32.	16.	1.10
+ HYDROGRAPH AT	415	412.	12.17	55.	16.	7.	.45
+ HYDROGRAPH AT	RT385	313.	12.23	35.	10.	5.	.65
+ ROUTED TO	RR385	285.	12.40	35.	10.	5.	.65
+ 3 COMBINED AT	415C	1254.	12.37	196.	56.	28.	1.55
+ ROUTED TO	R415	1225.	12.43	196.	56.	28.	1.55
+ HYDROGRAPH AT	455	1346.	12.13	142.	43.	21.	1.11
+ DIVERSION TO	BS455	1346.	12.13	137.	37.	18.	1.11
+ HYDROGRAPH AT	D455	55.	12.77	16.	6.	3.	1.11
+ HYDROGRAPH AT	RT455	1346.	12.13	137.	37.	18.	1.11
+ ROUTED TO	SR455	25.	10.47	25.	25.	18.	1.11
+ 2 COMBINED AT	C455	80.	12.77	41.	31.	21.	1.11
+ 3 COMBINED AT	455C	6924.	12.53	1347.	512.	315.	13.43
ROUTED TO	SR440	807.	13.90	792.	512.	315.	13.43
+ ROUTED TO	RR455	807.	14.23	792.	512.	312.	13.43
+ HYDROGRAPH AT	456	468.	12.07	35.	10.	5.	.26

+	DIVERSION TO	BASIN1	184.	12.07	8.	2.	1.	.26
+	HYDROGRAPH AT	DIV1	284.	12.07	27.	8.	4.	.26
+	DIVERSION TO	WA30	58.	12.07	10.	3.	2.	.26
+	HYDROGRAPH AT	DIV2	226.	12.07	18.	4.	2.	.26
+	ROUTED TO	R456	213.	12.13	18.	4.	2.	.26
+	HYDROGRAPH AT	457	264.	12.07	20.	5.	3.	.19
+	2 COMBINED AT	C101	462.	12.10	38.	10.	5.	.45
+	DIVERSION TO	BASIN2	165.	12.10	7.	2.	1.	.45
+	HYDROGRAPH AT	DIV3	297.	12.10	30.	8.	4.	.45
+	HYDROGRAPH AT	RTDIV3	165.	12.10	7.	2.	1.	.45
+	ROUTED TO	RFDIV3	2.	11.90	2.	2.	1.	.45
+	2 COMBINED AT	CDIV3	299.	12.10	32.	9.	5.	.45
+	ROUTED TO	R101	297.	12.10	32.	9.	5.	.45
+	HYDROGRAPH AT	458	356.	12.03	25.	7.	3.	.19
+	2 COMBINED AT	C103	635.	12.07	56.	16.	8.	.64
+	ROUTED TO	R103	630.	12.07	56.	16.	8.	.64
+	HYDROGRAPH AT	RT30	58.	12.07	10.	3.	2.	.26
+	ROUTED TO	R30	57.	12.10	10.	3.	2.	.26
+	HYDROGRAPH AT	RTB1	184.	12.07	8.	2.	1.	.26
+	ROUTED TO	B1	37.	12.23	8.	2.	1.	.26
+	ROUTED TO	RB1	37.	12.30	8.	2.	1.	.26
+	2 COMBINED AT	CDIV	87.	12.20	17.	5.	3.	.12
+	HYDROGRAPH AT	459	44.	12.03	3.	1.	0.	.03
+	2 COMBINED AT	C52	114.	12.13	20.	6.	3.	.15
+	ROUTED TO	R52	113.	12.17	20.	6.	3.	.15
+	HYDROGRAPH AT	460	214.	12.07	19.	6.	3.	.14
+	2 COMBINED AT	C102	312.	12.07	39.	12.	6.	.29
+	ROUTED TO	BASIN3	71.	12.63	39.	12.	6.	.29
+	ROUTED TO	R3	71.	12.77	39.	12.	6.	.29
+	HYDROGRAPH AT	461	161.	12.10	17.	5.	2.	.12
+	2 COMBINED AT	C104	213.	12.10	55.	17.	8.	.41
+	2 COMBINED AT	C106	835.	12.07	110.	32.	16.	1.05
+	ROUTED TO	R106	797.	12.13	110.	32.	16.	1.05
+	HYDROGRAPH AT	462	538.	12.07	40.	11.	5.	.30
+	2 COMBINED AT	C56	1254.	12.10	149.	42.	21.	1.35
	HYDROGRAPH AT	480	1050.	12.10	96.	29.	14.	.73
+	DIVERSION TO	BS480	455.	11.90	27.	8.	4.	.73
+	HYDROGRAPH AT	D480	1050.	12.10	78.	21.	10.	.73

+	HYDROGRAPH AT	RT480	455.	11.90	27.	8.	4.	.73
+	ROUTED TO	SR480	6.	3.90	6.	6.	4.	.73
+	2 COMBINED AT	C480	1056.	12.10	84.	27.	14.	.73
+	3 COMBINED AT	480C	2531.	12.10	969.	596.	356.	2.09
+	ROUTED TO	RR480	2370.	12.13	967.	596.	356.	2.09
+	HYDROGRAPH AT	500	1073.	12.27	122.	33.	16.	.93
+	2 COMBINED AT	500C	3260.	12.17	1078.	624.	370.	2.84

*** NORMAL END OF HEC-1 ***

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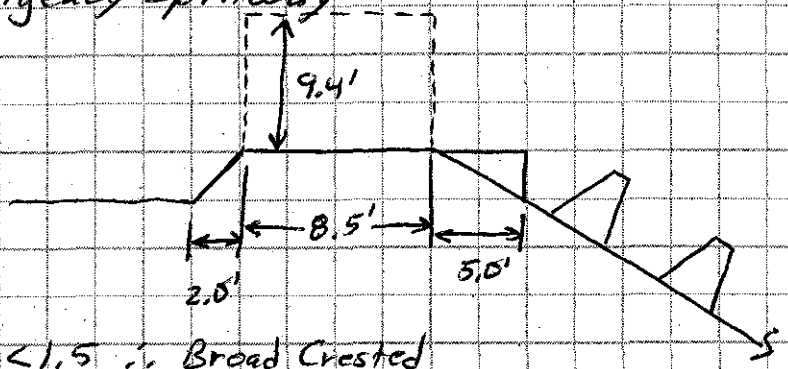
PROJECT Spook Hill ADMP

PROJECT NO. 99989 SHEET NO. ____ OF ____

EMERGENCY SPILLWAY CALC'S

CALCULATED BY RLH DATE 7/1/00 CHECKED BY ____ DATE ____

Signal Butte FRS Emergency Spillway



$BW = 140'$

$H_{max} = 9.4'$

$Crest\ Length = 8.5'$

$$\frac{H_{max}}{Crest\ Length} = \frac{9.4}{8.5} = 1.1 < 1.5 \therefore \text{Broad Crested}$$

- Discharge from overflow spillway = $Q = C_s b (H^{3/2})$ (ogee type)

C_s: spillway coefficient varies from 3 to 4 depending on H, C_s increases as H increases. Use 3.97 in the absence of other information.

$$Q = (3.97)(140)(9.4)^{3/2} = 16{,}018 \text{ cfs}$$

$$Q = (3.5)(140)(9.4)^{3/2} = 14{,}121 \text{ cfs}$$

$$Q = (3.0)(140)(9.4)^{3/2} = 12{,}104 \text{ cfs}$$

- Discharge over a rectangular weir:

$$Q = C_{wr} \frac{2}{3} \sqrt{2g}\,(b)(H^{3/2})$$

$$C_{wr} = 0.611 + 0.075\left(\frac{H}{P_w}\right) = 0.611 + 0.075\left(\frac{9.4}{9.4}\right) = 0.686$$

$$Q = (0.686)\frac{2}{3}\sqrt{2(32.2)}(140)(9.4^{3/2})$$

$$Q = 14{,}808 \text{ cfs}$$

Since contractions are not suppressed ~~beff~~ $b_{eff} = b_{actual} - 0.1 \times 2 \times 9.4$

$b_{eff} = 138.12$ ft

$Q_{eff} = 14{,}609$ cfs

WOOD/PATEL

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PROJECT

PROJECT NO. SHEET NO. OF

CALCULATED BY DATE CHECKED BY DATE

Discharge over a broad crested weir:

$d_c = 5.81\ ft$

$$Q = C_{wb}\left(\tfrac{2}{3}\right)^{3/2}(b)\sqrt{g}\,(H)^{3/2}$$

$$C_{wb} = \frac{0.65}{(1 + H/P_w)^{1/2}}$$

$$C_{wb} = \frac{0.65}{\left(1 + 9.4/9.4\right)^{1/2}}$$

$$C_{wb} = 0.4596$$

$$Q = (0.4596)\left(\tfrac{2}{3}\right)^{3/2}(140)(\sqrt{32.2})(9.4)^{3/2}$$

$$Q = 5728\ cfs$$

Worksheet
Worksheet for Broad Crested Weir

Project Description	
Worksheet	Signal Butte 2
Type	Broad Crested Weir
Solve For	Headwater Elevation

Input Data		
Discharge	11,126.00	cfs
Crest Elevation	1,712.40	ft
Tailwater Elevation	1,712.40	ft
Crest Surface Type	Paved	
Crest Breadth	8.50	ft
Crest Length	140.00	ft

Results		
Headwater Elevation	1,721.12	ft
Headwater Height Above Crest	8.72	ft
Tailwater Height Above Crest	0.00	ft
Discharge Coefficient	3.09	US
Submergence Factor	1.00	
Adjusted Discharge Coefficient	3.09	US
Flow Area	1,220.6	ft^2
Velocity	9.12	ft/s
Wetted Perimeter	157.44	ft
Top Width	140.00	ft

Worksheet
Worksheet for Broad Crested Weir

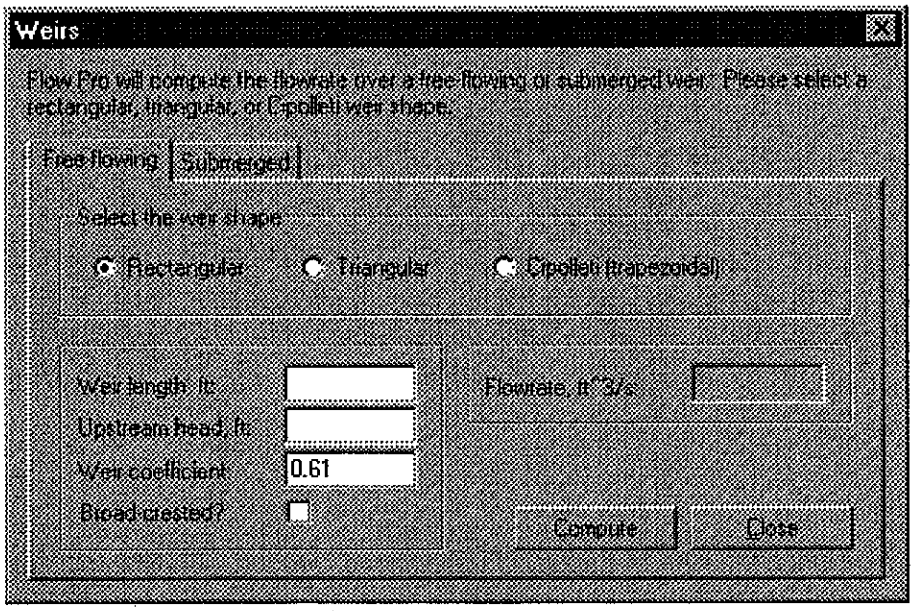
Project Description	
Worksheet	Signal Butte 2
Type	Broad Crested Weir
Solve For	Discharge

Input Data		
Headwater Elevation	1,721.40	ft
Crest Elevation	1,712.40	ft
Tailwater Elevation	1,712.40	ft
Crest Surface Type	Paved	
Crest Breadth	8.50	ft
Crest Length	140.00	ft

Results		
Discharge	11,668.86	cfs
Headwater Height Above Crest	9.00	ft
Tailwater Height Above Crest	0.00	ft
Discharge Coefficient	3.09	US
Submergence Factor	1.00	
Adjusted Discharge Coefficient	3.09	US
Flow Area	1,260.0	ft^2
Velocity	9.26	ft/s
Wetted Perimeter	158.00	ft
Top Width	140.00	ft

Weirs Help

Flow Pro can compute the flow over several types of weirs using the methodology described below. The main mechanisms governing flow over a weir are gravity and inertia. Viscous and surface tension effects are usually of secondary importance, and experimentally determined coefficients are used to account for them.



Rectangular Weirs

The basic equation for a rectangular weir is as follows:

$$Q = C_{wr}\frac{2}{3}\sqrt{2g}(b)(H)^{3/2}$$

where Cwr is a weir coefficient, g is the gravity constant, b is the cross channel width of the weir, and H is the height of the upstream free surface above the crest of the weir. The weir coefficient (Cwr) can be found from the following equation:

$$C_{wr} = 0.611 + 0.075\left(\frac{H}{P_w}\right)$$

where Pw is the height of the weir.

A submerged rectangular weir requires a more complex analysis, because the discharge is dependent on both the upstream and downstream depths. Submerged weirs will not be able to pass as much water as unsubmerged weirs. The following equation can be used to determine this reduced discharge:

$$Q_{submerged} = Q_{unsubmerged}\left[1-\left(\frac{H_{downstream}}{H_{upstream}}\right)^{3/2}\right]^{0.385}$$

If a rectangular weir has an opening width that is less than the channel width, the weir is

contracted and the discharging water decreases in width as it falls. If the weir extends the full width of the channel, these contractions are suppressed. The effective width for a contracted weir can be calculated using the following equation:

$$b_{effective} = b_{actual} - 0.1 \times N \times H$$

where N is one if one side is contracted, and N is two if both ends are contracted.

Triangular Weirs

The flow area for a triangular weir decreases as H decreases, so that even for small flowrates reasonable heads are developed. This allows accurate measurements to be obtained for a wide range of flows.

In general, the discharge equation for triangular weirs is as follows:

$$Q = C_{wt} \frac{8}{15} \tan\left(\frac{\theta}{2}\right) \sqrt{2g} (H)^{5/2}$$

where is the angle of the v-notch, and Cwt typically ranges from 0.58 to 0.62.

Cipolleti (trapezoidal) Weirs

If the angle of the sides is 4 units vertical and 1 unit horizontal (approximately 14° from the vertical) then the discharge from the triangular ends approximately makeup for the contractions that reduce rectangular flow. Therefore, no correction is theoretically necessary and the discharge is given below:

$$Q = 3.367(b)(H)^{3/2}$$

Broad-crested Weirs

The operation of a broad-crested weir is based on the fact that nearly uniform critical flow is achieved in the short reach above the weir block, assuming that $0.8 < H/L_w < 0.50$. For $H/L_w <$ 0.8 viscous affects are important, and the flow is subcritical. The equation for discharge over a broad-crested weir is as follows:

$$Q = C_{wb} \left(\frac{2}{3}\right)^{3/2} (b) \sqrt{g} (H)^{3/2}$$

where the broad-crested weir coefficient can be obtained from the equation

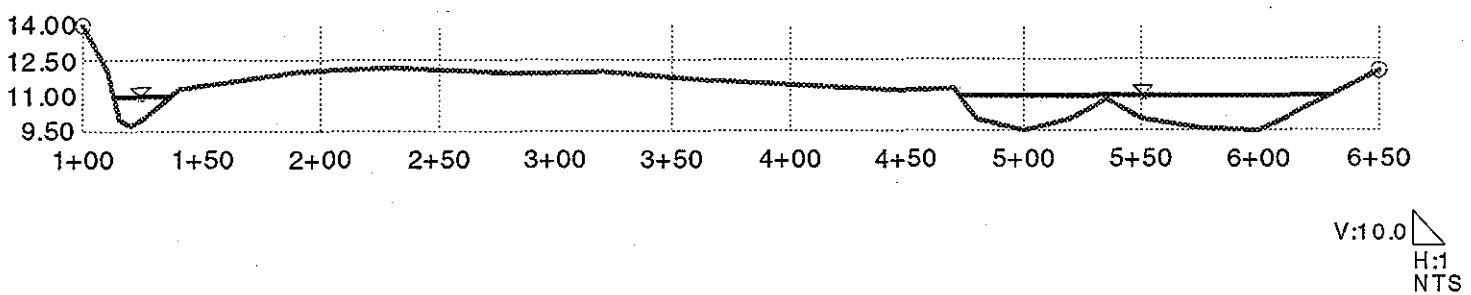
$$C_{wb} = \frac{0.65}{(1 + H / P_w)^{1/2}}$$

The head H should be measured at least 2.5H upstream from the weir to avoid the surface contraction of the water as it approaches the weir.

Section C-C
Cross Section for Irregular Channel

Project Description	
Worksheet	Section C-C
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.045	
Slope	0.030000	ft/ft
Water Surface Elevation	10.99	ft
Elevation Range	9.50 to 14.00	
Discharge	1,000.00	cfs



Section C-C
Worksheet for Irregular Channel

Project Description	
Worksheet	Section C-C
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.030000	ft/ft
Discharge	1,000.00	cfs

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.045	
Water Surface Elevation	10.99	ft
Elevation Range	9.50 to 14.00	
Flow Area	177.6	ft²
Wetted Perimeter	181.79	ft
Top Width	181.38	ft
Actual Depth	1.49	ft
Critical Elevation	10.99	ft
Critical Slope	0.029788	ft/ft
Velocity	5.63	ft/s
Velocity Head	0.49	ft
Specific Energy	11.48	ft
Froude Number	1.00	
Flow Type	Supercritical	

Calculation Messages:
Flow is divided.

Roughness Segments		
Start Station	End Station	Mannings Coefficient
1+00	6+50	0.045

Natural Channel Points	
Station (ft)	Elevation (ft)
1+00	14.00
1+10	12.00
1+15	10.00
1+20	9.70
1+25	10.00
1+40	11.30
1+90	12.00
2+30	12.20
2+90	11.90
3+20	12.00

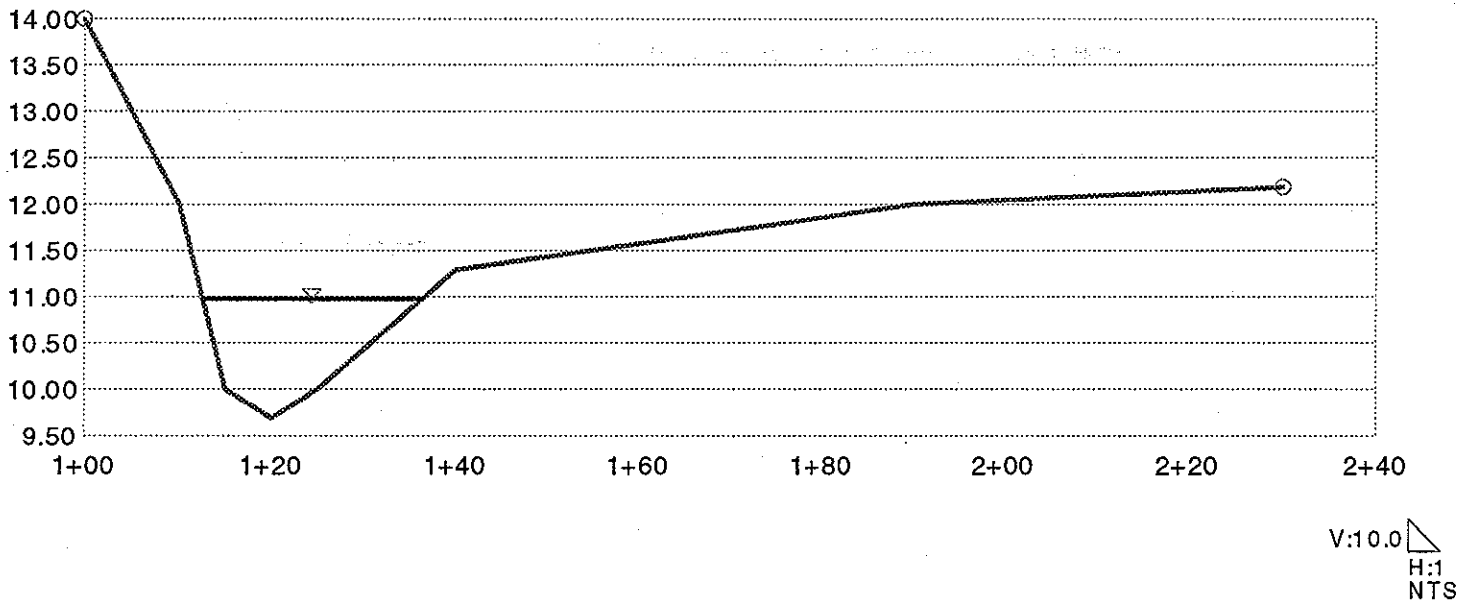
Section C-C
Worksheet for Irregular Channel

Natural Channel Points	
Station (ft)	Elevation (ft)
3+70	11.60
4+50	11.20
4+70	11.30
4+80	10.00
5+00	9.50
5+20	10.00
5+35	10.80
5+50	10.00
5+75	9.60
6+00	9.50
6+10	10.00
6+50	12.00

Section C-C, Left
Cross Section for Irregular Channel

Project Description	
Worksheet	Section C-C, Left
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Section Data		
Mannings Coefficient	0.045	
Slope	0.030000	ft/ft
Water Surface Elevation	10.99	ft
Elevation Range	9.70 to 14.00	
Discharge	87.08	cfs



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Section C-C, Left
Worksheet for Irregular Channel

Project Description	
Worksheet	Section C-C, Left
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Input Data		
Slope	0.030000	ft/ft
Water Surface Elevation	10.99	ft

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.045	
Elevation Range	9.70 to 14.00	
Discharge	87.08	cfs
Flow Area	18.3	ft^2
Wetted Perimeter	24.17	ft
Top Width	23.92	ft
Actual Depth	1.29	ft
Critical Elevation	10.97	ft
Critical Slope	0.032907	ft/ft
Velocity	4.75	ft/s
Velocity Head	0.35	ft
Specific Energy	11.34	ft
Froude Number	0.96	
Flow Type	Subcritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
1+00	2+30	0.045

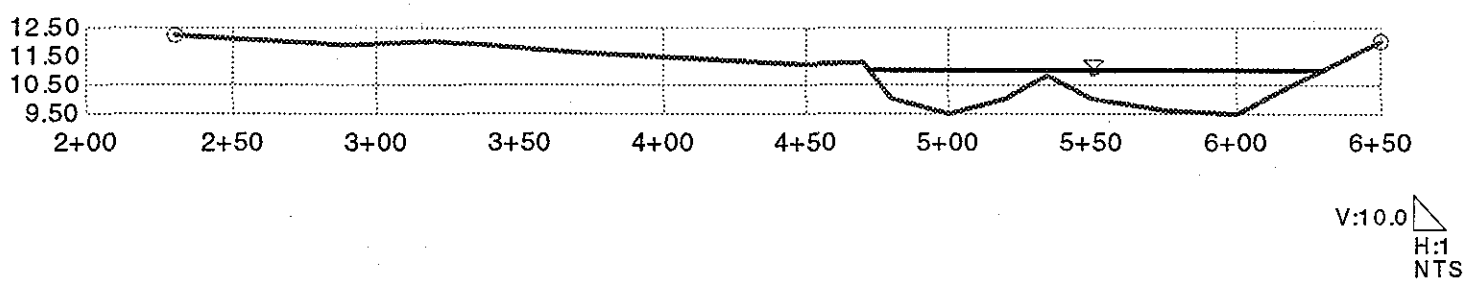
Natural Channel Points

Station (ft)	Elevation (ft)
1+00	14.00
1+10	12.00
1+15	10.00
1+20	9.70
1+25	10.00
1+40	11.30
1+90	12.00
2+30	12.20

Sect[illegible]-C, Right
Cross Section for Irregular Channel

Project Description	
Worksheet	Section C-C, Right
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Section Data		
Mannings Coefficient	0.045	
Slope	0.030000	ft/ft
Water Surface Elevation	10.99	ft
Elevation Range	9.50 to 12.20	
Discharge	917.30	cfs



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Section C-C, Right
Worksheet for Irregular Channel

Project Description	
Worksheet	Section C-C, Right
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Input Data		
Slope	0.030000	ft/ft
Water Surface Elevation	10.99	ft

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.045	
Elevation Range	9.50 to 12.20	
Discharge	917.30	cfs
Flow Area	159.3	ft²
Wetted Perimeter	157.62	ft
Top Width	157.46	ft
Actual Depth	1.49	ft
Critical Elevation	11.00	ft
Critical Slope	0.029381	ft/ft
Velocity	5.76	ft/s
Velocity Head	0.52	ft
Specific Energy	11.51	ft
Froude Number	1.01	
Flow Type	Supercritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
2+30	6+50	0.045

Natural Channel Points

Station (ft)	Elevation (ft)
2+30	12.20
2+90	11.90
3+20	12.00
3+70	11.60
4+50	11.20
4+70	11.30
4+80	10.00
5+00	9.50
5+20	10.00
5+35	10.80
5+50	10.00
5+75	9.60
6+00	9.50

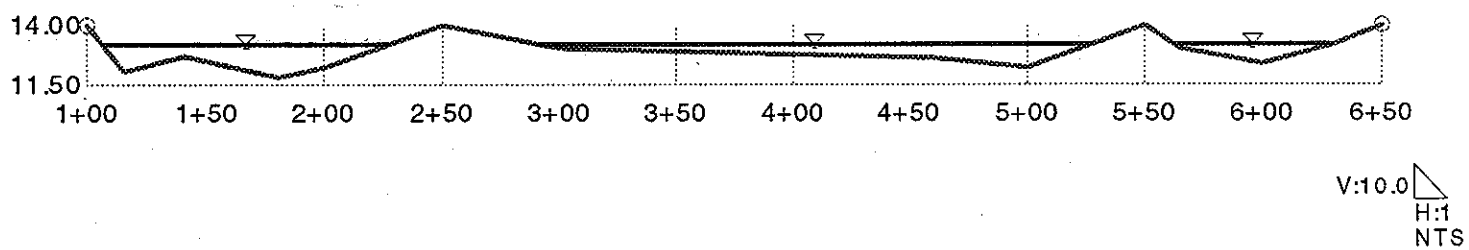
Section C-C, Right
Worksheet for Irregular Channel

Natural Channel Points	
Station (ft)	Elevation (ft)
6+10	10.00
6+50	12.00

Section D-D
Cross Section for Irregular Channel

Project Description	
Worksheet	Section D-D
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.045	
Slope	0.030000	ft/ft
Water Surface Elevation	13.18	ft
Elevation Range	11.80 to 14.00	
Discharge	915.00	cfs



Section D-D
Worksheet for Irregular Channel

Project Description	
Worksheet	Section D-D
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.030000	ft/ft
Discharge	915.00	cfs

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.045	
Water Surface Elevation	13.18	ft
Elevation Range	11.80 to 14.00	
Flow Area	236.5	ft^2
Wetted Perimeter	425.11	ft
Top Width	424.95	ft
Actual Depth	1.38	ft
Critical Elevation	13.15	ft
Critical Slope	0.036502	ft/ft
Velocity	3.87	ft/s
Velocity Head	0.23	ft
Specific Energy	13.42	ft
Froude Number	0.91	
Flow Type	Subcritical	

Calculation Messages:
Flow is divided.

Roughness Segments		
Start Station	End Station	Mannings Coefficient
1+00	6+50	0.045

Natural Channel Points	
Station (ft)	Elevation (ft)
1+00	14.00
1+15	12.00
1+40	12.70
1+80	11.80
2+00	12.20
2+50	14.00
3+00	13.00
4+60	12.60
5+00	12.20
5+50	14.00

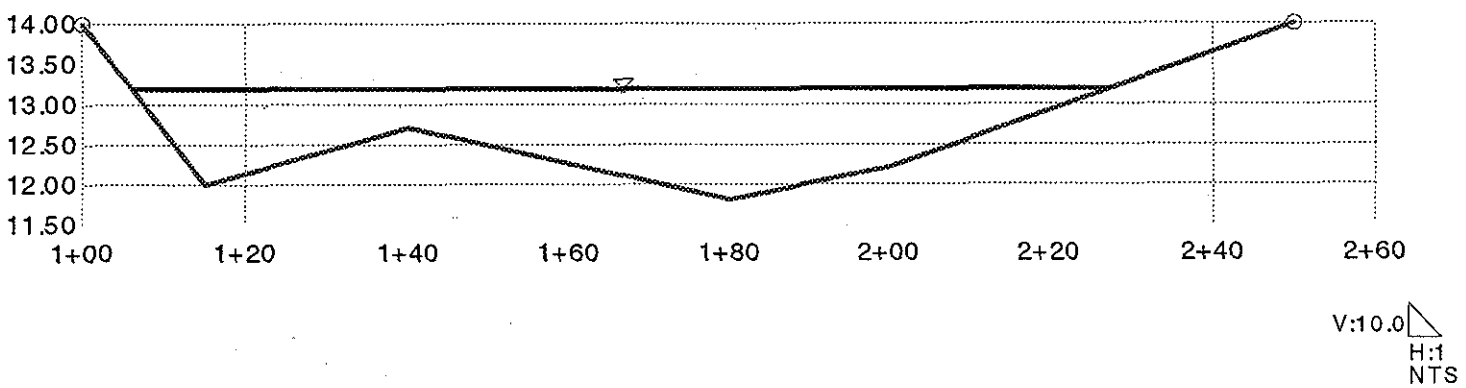
Section D-D
Worksheet for Irregular Channel

Natural Channel Points	
Station (ft)	Elevation (ft)
5+65	13.00
6+00	12.40
6+30	13.20
6+50	14.00

Section D-D, Left
Cross Section for Irregular Channel

Project Description	
Worksheet	Section D-D, Left
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Section Data		
Mannings Coefficient	0.045	
Slope	0.030000	ft/ft
Water Surface Elevation	13.18	ft
Elevation Range	11.80 to 14.00	
Discharge	507.97	cfs



Section D-D, Left
Worksheet for Irregular Channel

Project Description	
Worksheet	Section D-D, Left
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Input Data		
Slope	0.030000	ft/ft
Water Surface Elevation	13.18	ft

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.045	
Elevation Range	11.80 to 14.00	
Discharge	507.97	cfs
Flow Area	100.6	ft²
Wetted Perimeter	121.34	ft
Top Width	121.22	ft
Actual Depth	1.38	ft
Critical Elevation	13.17	ft
Critical Slope	0.031575	ft/ft
Velocity	5.05	ft/s
Velocity Head	0.40	ft
Specific Energy	13.58	ft
Froude Number	0.98	
Flow Type	Subcritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
1+00	2+50	0.045

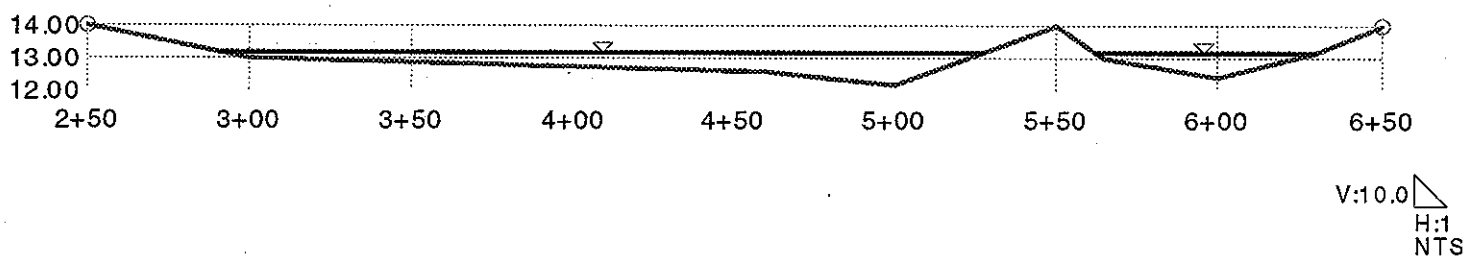
Natural Channel Points

Station (ft)	Elevation (ft)
1+00	14.00
1+15	12.00
1+40	12.70
1+80	11.80
2+00	12.20
2+50	14.00

Section D-D, Right
Cross Section for Irregular Channel

Project Description	
Worksheet	Section D-D, Right
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Section Data		
Mannings Coefficient	0.045	
Slope	0.030000	ft/ft
Water Surface Elevation	13.18	ft
Elevation Range	12.20 to 14.00	
Discharge	454.57	cfs



Section D-D, Right
Worksheet for Irregular Channel

Project Description	
Worksheet	Section D-D, Right
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Input Data	
Slope	0.030000 ft/ft
Water Surface Elevation	13.18 ft

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results	
Mannings Coefficient	0.045
Elevation Range	12.20 to 14.00
Discharge	454.57 cfs
Flow Area	135.9 ft²
Wetted Perimeter	303.77 ft
Top Width	303.72 ft
Actual Depth	0.98 ft
Critical Elevation	13.15 ft
Critical Slope	0.039536 ft/ft
Velocity	3.35 ft/s
Velocity Head	0.17 ft
Specific Energy	13.36 ft
Froude Number	0.88
Flow Type	Subcritical

Calculation Messages:
Flow is divided.

Roughness Segments

Start Station	End Station	Mannings Coefficient
2+50	6+50	0.045

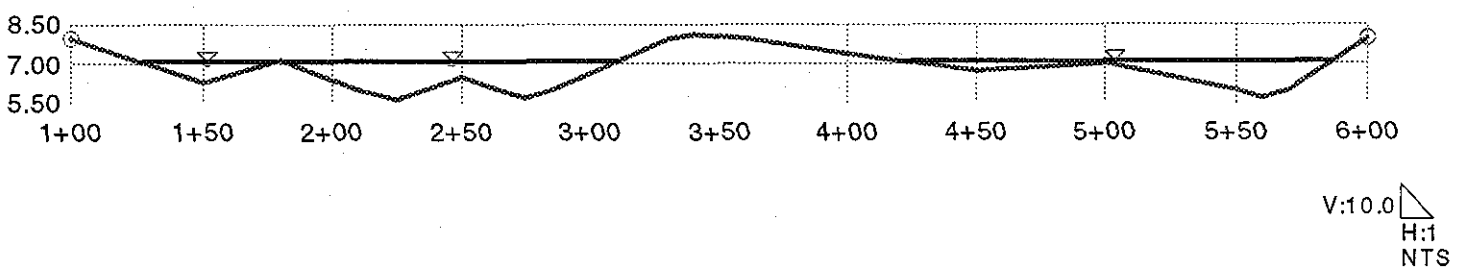
Natural Channel Points

Station (ft)	Elevation (ft)
2+50	14.00
3+00	13.00
4+60	12.60
5+00	12.20
5+50	14.00
5+65	13.00
6+00	12.40
6+30	13.20
6+50	14.00

Section B-B
Cross Section for Irregular Channel

Project Description	
Worksheet	Section B-B
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

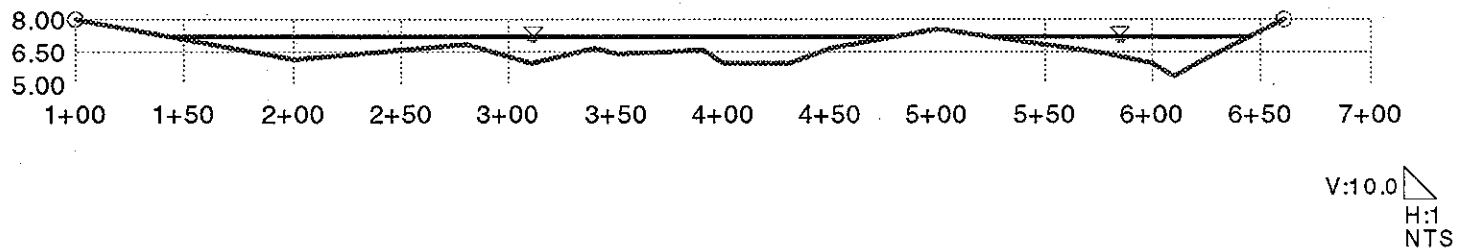
Section Data		
Mannings Coefficient	0.045	
Slope	0.025000	ft/ft
Water Surface Elevation	7.12	ft
Elevation Range	5.60 to 8.10	
Discharge	864.00	cfs



Section A-A
Cross Section for Irregular Channel

Project Description	
Worksheet	Section A-A
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.045	
Slope	0.020000	ft/ft
Water Surface Elevation	7.21	ft
Elevation Range	5.40 to 8.00	
Discharge	1,192.00	cfs



Section A-A
Worksheet for Irregular Channel

Project Description	
Worksheet	Section A-A
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.020000	ft/ft
Discharge	1,192.00	cfs

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.045	
Water Surface Elevation	7.21	ft
Elevation Range	5.40 to 8.00	
Flow Area	321.0	ft²
Wetted Perimeter	452.57	ft
Top Width	452.42	ft
Actual Depth	1.81	ft
Critical Elevation	7.08	ft
Critical Slope	0.034574	ft/ft
Velocity	3.71	ft/s
Velocity Head	0.21	ft
Specific Energy	7.42	ft
Froude Number	0.78	
Flow Type	Subcritical	

Calculation Messages:
Flow is divided.

Roughness Segments

Start Station	End Station	Mannings Coefficient
1+00	6+60	0.045

Natural Channel Points

Station (ft)	Elevation (ft)
1+00	8.00
2+00	6.20
2+80	6.90
3+10	6.00
3+40	6.70
3+50	6.40
3+90	6.60
4+00	6.00
4+30	6.00
4+50	6.70

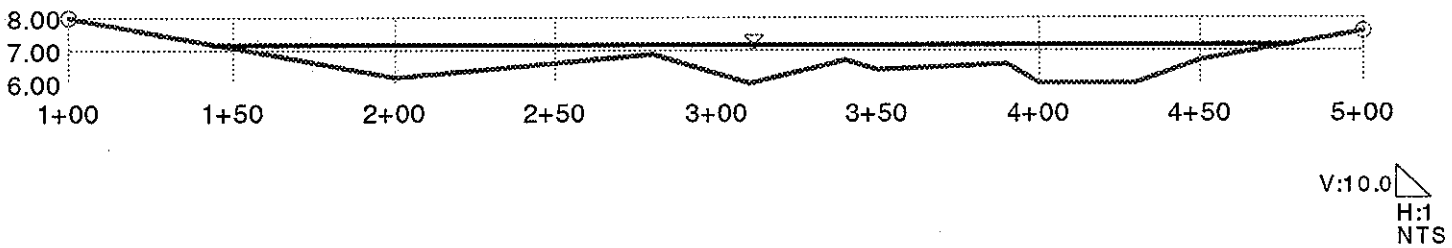
Section A-A
Worksheet for Irregular Channel

Natural Channel Points	
Station (ft)	Elevation (ft)
5+00	7.60
5+80	6.40
6+00	6.00
6+10	5.40
6+20	6.00
6+60	8.00

Section A-A, Left
Cross Section for Irregular Channel

Project Description	
Worksheet	Section A-A, Left
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Section Data		
Mannings Coefficient	0.045	
Slope	0.020000	ft/ft
Water Surface Elevation	7.21	ft
Elevation Range	6.00 to 8.00	
Discharge	864.53	cfs



Section A-A, Left
Worksheet for Irregular Channel

Project Description	
Worksheet	Section A-A, Left
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Input Data		
Slope	0.020000	ft/ft
Water Surface Elevation	7.21	ft

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.045	
Elevation Range	6.00 to 8.00	
Discharge	864.53	cfs
Flow Area	234.6	ft²
Wetted Perimeter	334.52	ft
Top Width	334.44	ft
Actual Depth	1.21	ft
Critical Elevation	7.09	ft
Critical Slope	0.034834	ft/ft
Velocity	3.69	ft/s
Velocity Head	0.21	ft
Specific Energy	7.42	ft
Froude Number	0.78	
Flow Type	Subcritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
1+00	5+00	0.045

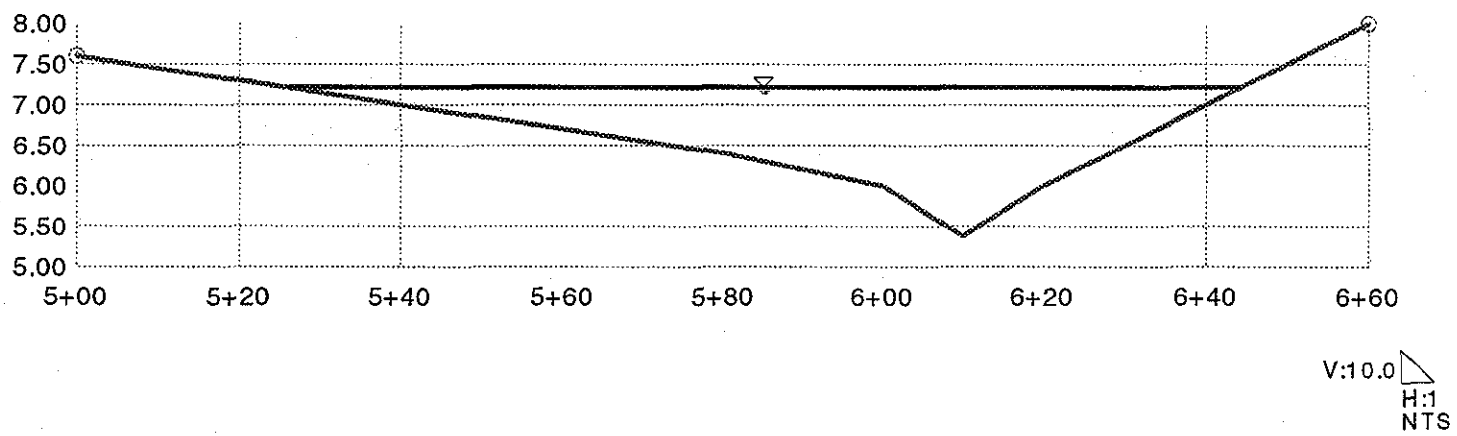
Natural Channel Points

Station (ft)	Elevation (ft)
1+00	8.00
2+00	6.20
2+80	6.90
3+10	6.00
3+40	6.70
3+50	6.40
3+90	6.60
4+00	6.00
4+30	6.00
4+50	6.70
5+00	7.60

Section A-A, Right
Cross Section for Irregular Channel

Project Description	
Worksheet	Section A-A, Right
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Section Data		
Mannings Coefficient	0.045	
Slope	0.020000	ft/ft
Water Surface Elevation	7.21	ft
Elevation Range	5.40 to 8.00	
Discharge	329.84	cfs



Section A-A, Right
Worksheet for Irregular Channel

Project Description	
Worksheet	Section A-A, Right
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Input Data		
Slope	0.020000	ft/ft
Water Surface Elevation	7.21	ft

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.045	
Elevation Range	5.40 to 8.00	
Discharge	329.84	cfs
Flow Area	86.8	ft²
Wetted Perimeter	118.18	ft
Top Width	118.10	ft
Actual Depth	1.81	ft
Critical Elevation	7.07	ft
Critical Slope	0.033744	ft/ft
Velocity	3.80	ft/s
Velocity Head	0.22	ft
Specific Energy	7.43	ft
Froude Number	0.78	
Flow Type	Subcritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
5+00	6+60	0.045

Natural Channel Points

Station (ft)	Elevation (ft)
5+00	7.60
5+80	6.40
6+00	6.00
6+10	5.40
6+20	6.00
6+60	8.00

Section B-B
Worksheet for Irregular Channel

Project Description	
Worksheet	Section B-B
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.025000	ft/ft
Discharge	864.00	cfs

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.045	
Water Surface Elevation	7.12	ft
Elevation Range	5.60 to 8.10	
Flow Area	222.7	ft²
Wetted Perimeter	347.58	ft
Top Width	347.41	ft
Actual Depth	1.52	ft
Critical Elevation	7.05	ft
Critical Slope	0.035132	ft/ft
Velocity	3.88	ft/s
Velocity Head	0.23	ft
Specific Energy	7.36	ft
Froude Number	0.85	
Flow Type	Subcritical	

Calculation Messages:
Flow is divided.

Roughness Segments

Start Station	End Station	Mannings Coefficient
1+00	6+00	0.045

Natural Channel Points

Station (ft)	Elevation (ft)
1+00	8.00
1+50	6.30
1+80	7.20
2+10	6.00
2+25	5.60
2+35	6.00
2+50	6.50
2+65	6.00
2+75	5.70
2+85	6.00

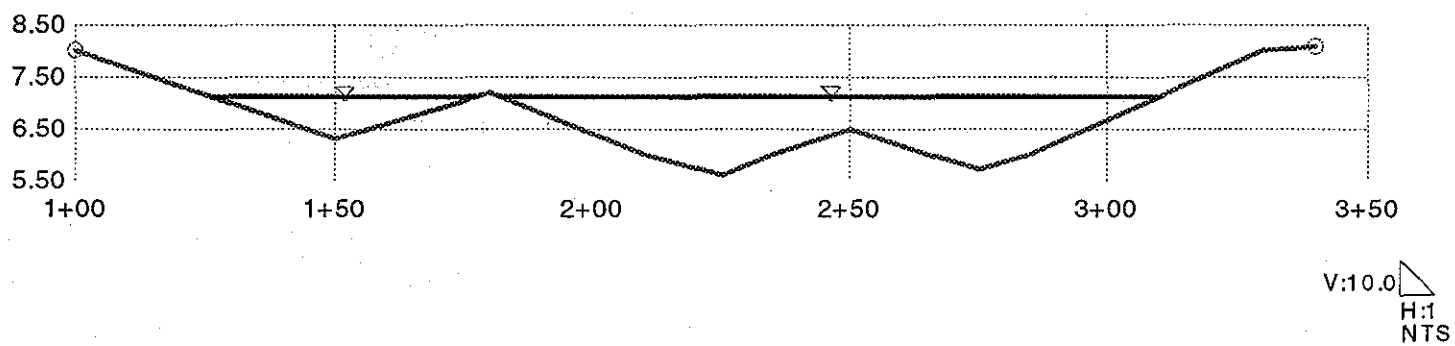
Section B-B
Worksheet for Irregular Channel

Natural Channel Points	
Station (ft)	Elevation (ft)
3+30	8.00
3+40	8.10
3+60	8.00
4+00	7.40
4+50	6.70
5+00	7.00
5+50	6.00
5+60	5.70
5+70	6.00
6+00	8.00

Sect[illegible]3-B, Left
Cross Section for Irregular Channel

Project Description	
Worksheet	Section B-B, Left
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Section Data		
Mannings Coefficient	0.045	
Slope	0.025000	ft/ft
Water Surface Elevation	7.12	ft
Elevation Range	5.60 to 8.10	
Discharge	590.25	cfs



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Wood, Patel & Associates, Inc
37 Brookside Road Waterbury, CT 06708 USA (203) 755-1666

Section B-B, Left
Worksheet for Irregular Channel

Project Description	
Worksheet	Section B-B, Left
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Input Data		
Slope	0.025000	ft/ft
Water Surface Elevation	7.12	ft

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.045	
Elevation Range	5.60 to 8.10	
Discharge	590.25	cfs
Flow Area	136.3	ft²
Wetted Perimeter	180.30	ft
Top Width	180.19	ft
Actual Depth	1.52	ft
Critical Elevation	7.05	ft
Critical Slope	0.033017	ft/ft
Velocity	4.33	ft/s
Velocity Head	0.29	ft
Specific Energy	7.42	ft
Froude Number	0.88	
Flow Type	Subcritical	

Calculation Messages:
Flow is divided.

Roughness Segments

Start Station	End Station	Mannings Coefficient
1+00	3+40	0.045

Natural Channel Points

Station (ft)	Elevation (ft)
1+00	8.00
1+50	6.30
1+80	7.20
2+10	6.00
2+25	5.60
2+35	6.00
2+50	6.50
2+65	6.00
2+75	5.70
2+85	6.00

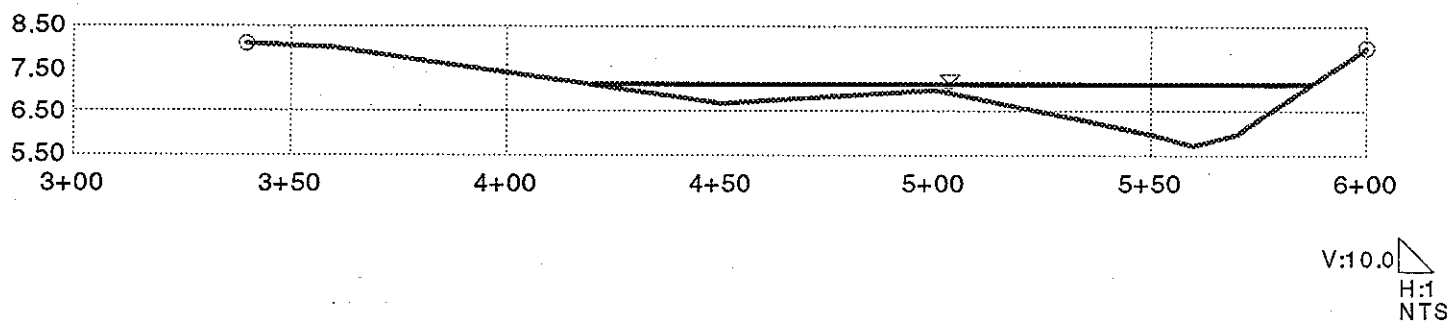
Section B-B, Left
Worksheet for Irregular Channel

Natural Channel Points	
Station (ft)	Elevation (ft)
3+30	8.00
3+40	8.10

Section B-B, Right
Cross Section for Irregular Channel

Project Description	
Worksheet	Section B-B, Right
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Section Data		
Mannings Coefficient	0.045	
Slope	0.025000	ft/ft
Water Surface Elevation	7.12	ft
Elevation Range	5.70 to 8.10	
Discharge	290.49	cfs



Section B-B, Right
Worksheet for Irregular Channel

Project Description	
Worksheet	Section B-B, Right
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Input Data		
Slope	0.025000	ft/ft
Water Surface Elevation	7.12	ft

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

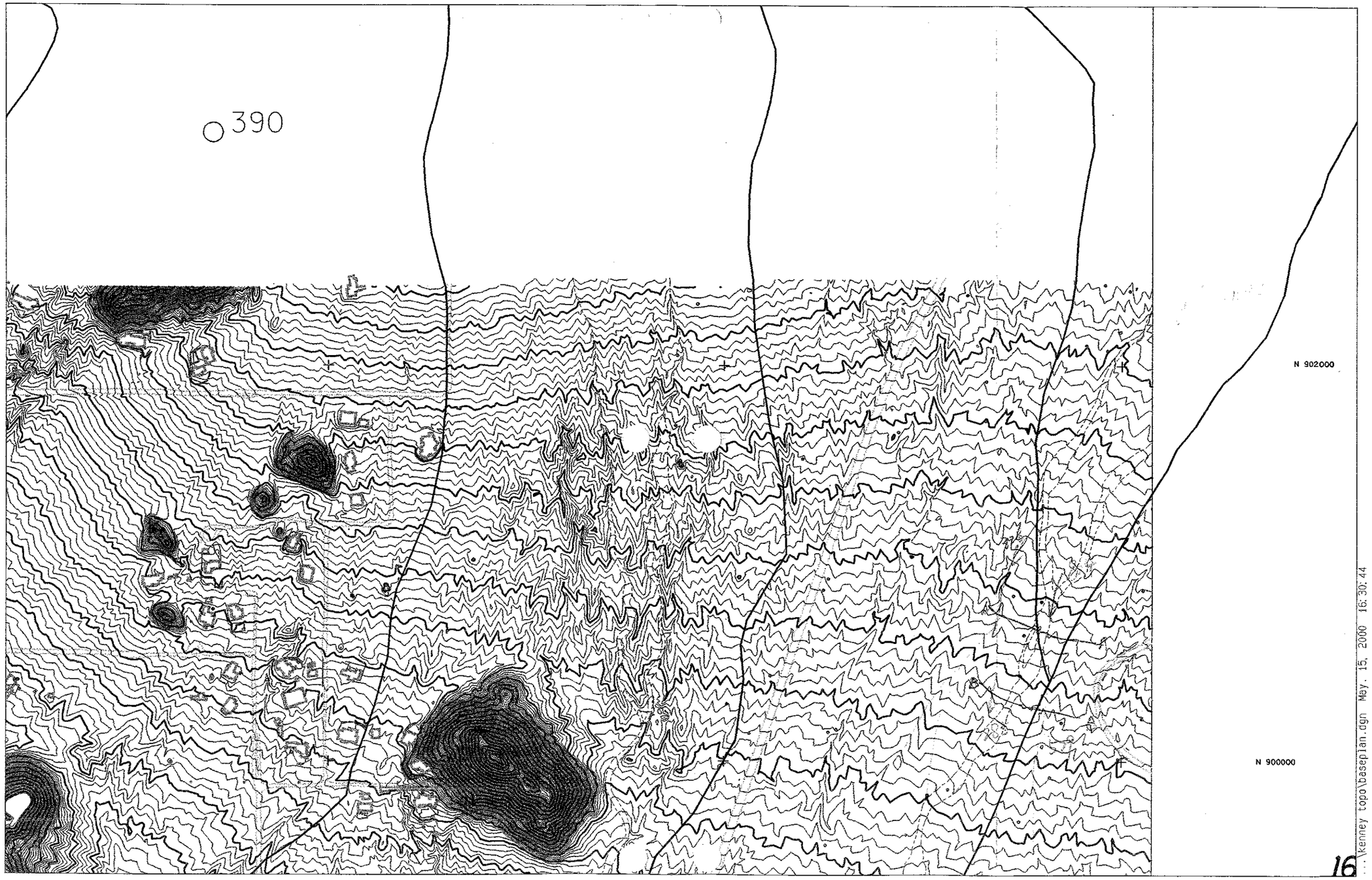
Results		
Mannings Coefficient	0.045	
Elevation Range	5.70 to 8.10	
Discharge	290.49	cfs
Flow Area	86.4	ft^2
Wetted Perimeter	167.28	ft
Top Width	167.22	ft
Actual Depth	1.42	ft
Critical Elevation	7.06	ft
Critical Slope	0.038092	ft/ft
Velocity	3.36	ft/s
Velocity Head	0.18	ft
Specific Energy	7.30	ft
Froude Number	0.82	
Flow Type	Subcritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
3+40	6+00	0.045

Natural Channel Points

Station (ft)	Elevation (ft)
3+40	8.10
3+60	8.00
4+00	7.40
4+50	6.70
5+00	7.00
5+50	6.00
5+60	5.70
5+70	6.00
6+00	8.00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WOOD/PATEL

CIVIL ENGINEERS • HYDROLOGISTS • LAND SURVEYORS • CONSTRUCTION MANAGERS

PROJECT Spook Hill ADMP NO. 99989

CALC'D BY JDS CHK'D BY

SHEET OF DATE 6/1/01

- Calculate the Spook Hill Principal spillway stage-Discharge curve
- Check the inlet control of the 7.5'x7' conduit.
  (see HY8 print out)

WOOD/PATEL

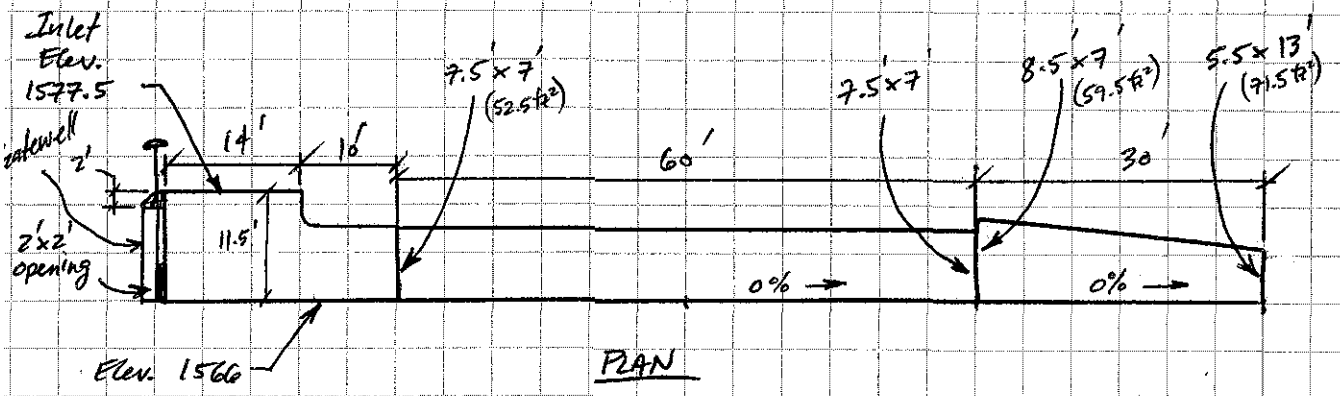
CIVIL ENGINEERS • HYDROLOGISTS • LAND SURVEYORS • CONSTRUCTION MANAGERS

PROJECT Spook Hill ADMP NO. 99989

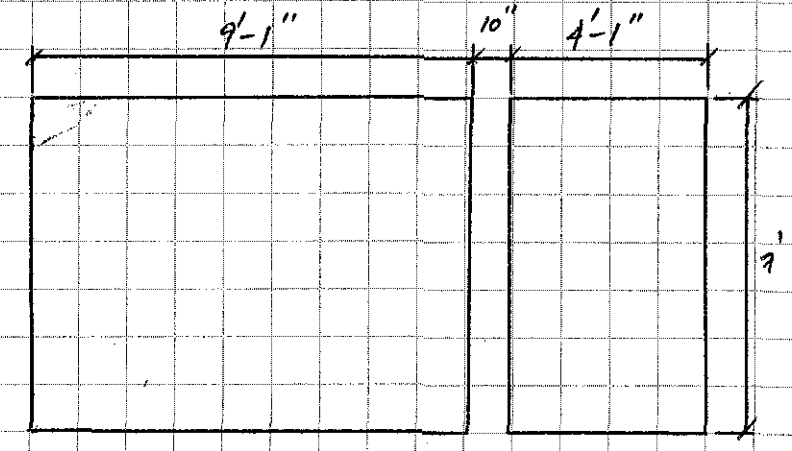
CALC'D BY JDS CHK'D BY

SHEET OF DATE 6/1/01

Principal Spillway Details

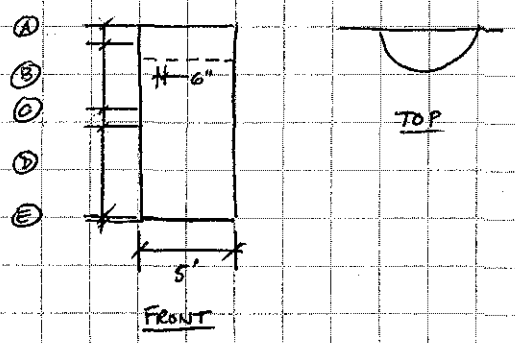


PLAN



INLET DETAIL

Gate well



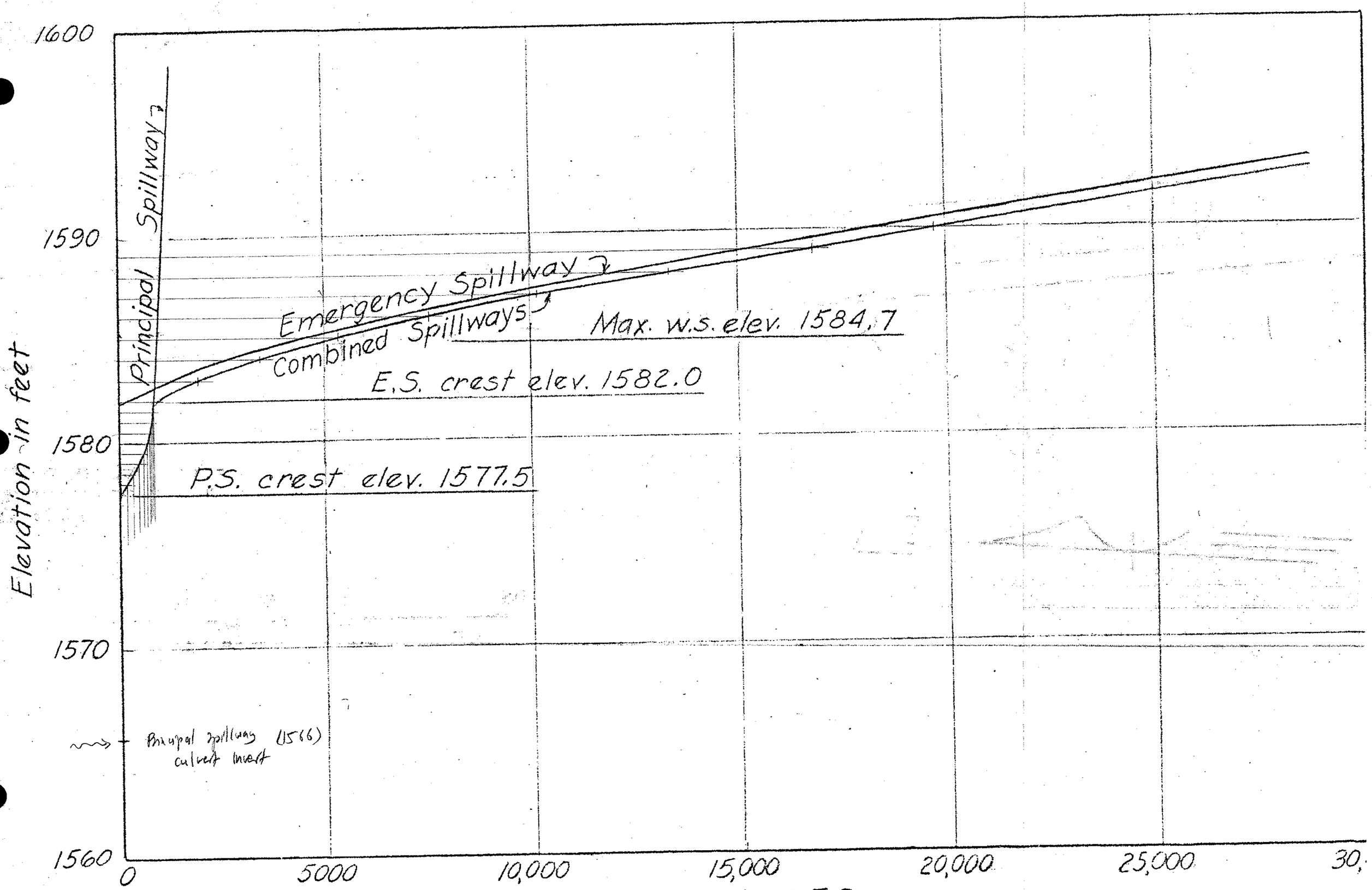
(A) $12\frac{1}{2}$"

(B) 21 rows $3/8" \times 6"$ slots @ $2\frac{1}{2}$" c.c. = ~~$52\frac{1}{2}$"~~ 50"

(C) 13"

(D) 16 rows $3/8" \times 6"$ slots @ $2\frac{1}{2}$" c.c. = ~~40"~~ 37.5"

(E) 1"


1600
1590
1580
1570
1560
Elevation in feet
0
5000
10,000
15,000
20,000
25,000
30,
Principal Spillway
Emergency Spillway
Combined Spillways
Max. w.s. elev. 1584.7
E.S. crest elev. 1582.0
P.S. crest elev. 1577.5
Principal spillway (1566)
culvert invert

Inlet control analysis W/P

	Elevation NAVD 29	Elevation NAVD 88	Discharge
1.86			
	74.77	74.77	500
	76.07	76.07	600
	77.63	77.63	700
	79.37	79.37	800
	81.31	81.31	900
	83.48	83.48	1000

Weir flow by W/P - (Kindsvater and Carter)

Elevation NAVD 29	Elevation NAVD 88	Head (h1)	h1e	h1/p	L/B	C_1	C_2	Ce	L	kb	Le	Discharge
77.5	79.36	0	0	0.000	0.620508	0.0995	3.178	3.178	40.333	0.012	40.345	0
78	79.86	0.5	0.503	0.043	0.620508	0.0995	3.178	3.182	40.333	0.012	40.345	45.8
78.5	80.36	1	1.003	0.087	0.620508	0.0995	3.178	3.187	40.333	0.012	40.345	129.1
79	80.86	1.5	1.503	0.130	0.620508	0.0995	3.178	3.191	40.333	0.012	40.345	237.2
79.5	81.36	2	2.003	0.174	0.620508	0.0995	3.178	3.195	40.333	0.012	40.345	365.4
80	81.86	2.5	2.503	0.217	0.620508	0.0995	3.178	3.200	40.333	0.012	40.345	511.2
80.5	82.36	3	3.003	0.261	0.620508	0.0995	3.178	3.204	40.333	0.012	40.345	672.7
81	82.86	3.5	3.503	0.304	0.620508	0.0995	3.178	3.208	40.333	0.012	40.345	848.6
81.5	83.36	4	4.003	0.348	0.620508	0.0995	3.178	3.213	40.333	0.012	40.345	1038.1
82	83.86	4.5	4.503	0.391	0.620508	0.0995	3.178	3.217	40.333	0.012	40.345	1240.2

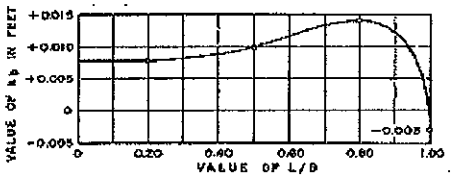
Elm Spillway crest

Q100:

p = upstream depth = 11.5'
L = crest length = 40.333' or 42' 40.333
B = Upstream channel width = L or 65' 65

$$C_e = C_1 (h_1 / p) + C_2$$

L/B	C_1	C_2	kb
0.2	-0.0087	3.152	0.007
0.4	0.0317	3.164	0.008
0.5	0.0612	3.173	0.01
0.6	0.0995	3.178	0.012
0.7	0.1602	3.182	0.013
0.8	0.2376	3.189	0.014
0.9	0.3447	3.205	0.012
1	0.4	3.22	-0.003



$$Q = C_e L_e h_{1e}^{3/2}$$

Q = discharge, cubic feet per second (ft^3/s)
e = a subscript denoting "effective"
C_e = effective coefficient of discharge, $ft^{1/2}/s$
$L_e = L + k_b$
$h_{1e} = h_1 + k_h$

k_b = a correction factor to obtain effective weir length
L = measured length of weir crest
B = average width of approach channel, ft
h_1 = head measured above the weir crest, ft
k_h = a correction factor with a value of 0.003 ft

This data is all from the USBR Water Measurement Manual
http://www.usbr.gov/wrrl/fmt/wmm

CURRENT DATE: 06-01-2001
CURRENT TIME: 11:26:57

FILE DATE: 06-01-2001
FILE NAME: P-SPLWAY

FHWA CULVERT ANALYSIS
HY-8, VERSION 6.1

CULV NO.	SITE DATA			CULVERT SHAPE, MATERIAL, INLET				
	INLET ELEV. (ft)	OUTLET ELEV. (ft)	CULVERT LENGTH (ft)	BARRELS SHAPE MATERIAL	SPAN (ft)	RISE (ft)	MANNING n	INLET TYPE
1	66.00	66.00	60.00	1 RCB	7.00	7.50	.012	CONVENTIONAL
2								
3								
4								
5								
6								

SUMMARY OF CULVERT FLOWS (cfs) FILE: P-SPLWAY DATE: 06-01-2001

ELEV (ft)	TOTAL	1	2	3	4	5	6	ROADWAY	ITR
66.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
69.16	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
70.89	200.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
72.32	300.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
73.60	400.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
74.77	500.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
76.07	600.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
77.63	700.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
79.37	800.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
81.31	900.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
83.48	1000.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	OVERTOPPING	

SUMMARY OF ITERATIVE SOLUTION ERRORS FILE: P-SPLWAY DATE: 06-01-2001

HEAD ELEV (ft)	HEAD ERROR (ft)	TOTAL FLOW (cfs)	FLOW ERROR (cfs)	% FLOW ERROR
66.00	0.000	0.00	0.00	0.00
69.16	0.000	100.00	0.00	0.00
70.89	0.000	200.00	0.00	0.00
72.32	0.000	300.00	0.00	0.00
73.60	0.000	400.00	0.00	0.00
74.77	0.000	500.00	0.00	0.00
76.07	0.000	600.00	0.00	0.00
77.63	0.000	700.00	0.00	0.00
79.37	0.000	800.00	0.00	0.00
81.31	0.000	900.00	0.00	0.00
83.48	0.000	1000.00	0.00	0.00

<1> TOLERANCE (ft) = 0.010 <2> TOLERANCE (%) = 1.000

CURRENT DATE: 06-01-2001
CURRENT TIME: 11:26:57

FILE DATE: 06-01-2001
FILE NAME: P-SPLWAY

PERFORMANCE CURVE FOR CULVERT 1 - 1(7.00 (ft) BY 7.50 (ft)) RCB

DIS-CHARGE FLOW (cfs)	HEAD-WATER ELEV. (ft)	INLET CONTROL DEPTH (ft)	OUTLET CONTROL DEPTH (ft)	FLOW TYPE <F4>	NORMAL DEPTH (ft)	CRIT. DEPTH (ft)	OUTLET DEPTH (ft)	TW DEPTH (ft)	OUTLET VEL. (fps)	TW VEL. (fps)
0.00	66.00	0.00	0.00	0-NF	0.00	0.00	0.00	0.00	0.00	0.00
100.00	69.16	2.96	3.16	3-M2t	7.50	1.85	2.48	2.48	5.76	0.00
200.00	70.89	4.62	4.89	3-M2t	7.50	2.94	3.70	3.70	7.72	0.00
300.00	72.32	6.00	6.32	3-M2t	7.50	3.86	4.65	4.65	9.22	0.00
400.00	73.60	7.32	7.60	3-M2t	7.50	4.67	5.45	5.45	10.48	0.00
500.00	74.77	8.65	8.77	3-M2t	7.50	5.42	6.16	6.16	11.60	0.00
600.00	76.07	10.07	9.87	3-M2t	7.50	6.12	6.80	6.80	12.61	0.00
700.00	77.63	11.63	11.09	3-M2t	7.50	6.79	7.39	7.39	13.53	0.00
800.00	79.37	13.37	7.94	3-M2t	7.50	7.42	7.39	7.94	15.46	0.00
900.00	81.31	15.31	14.44	4-S2n	7.50	7.50	7.40	8.45	17.37	0.00
1000.00	83.48	17.48	16.33	4-S2n	7.50	7.50	7.40	8.93	19.31	0.00

El. inlet face invert 66.00 ft El. outlet invert 66.00 ft
El. inlet throat invert 0.00 ft El. inlet crest 0.00 ft

***** SITE DATA ***** CULVERT INVERT **********

INLET STATION	0.00 ft
INLET ELEVATION	66.00 ft
OUTLET STATION	60.00 ft
OUTLET ELEVATION	66.00 ft
NUMBER OF BARRELS	1
SLOPE (V/H)	0.0000
CULVERT LENGTH ALONG SLOPE	60.00 ft

***** CULVERT DATA SUMMARY **********

BARREL SHAPE	BOX
BARREL SPAN	7.00 ft
BARREL RISE	7.50 ft
BARREL MATERIAL	CONCRETE
BARREL MANNING'S n	0.012
INLET TYPE	CONVENTIONAL
INLET EDGE AND WALL	1:1 BEVEL
INLET DEPRESSION	NONE

CURRENT DATE: 06-01-2001
CURRENT TIME: 11:26:57

FILE DATE: 06-01-2001
FILE NAME: P-SPLWAY

TAILWATER

TAILWATER RATING CURVE

FLOW (cfs)	W.S.E.(ft)	DEPTH (ft)
0	66.00	0.00
100	68.48	2.48
200	69.70	3.70
300	70.65	4.65
400	71.45	5.45
500	72.16	6.16
600	72.80	6.80
700	73.39	7.39
800	73.94	7.94
900	74.45	8.45
1000	74.93	8.93

ROADWAY OVERTOPPING DATA

ROADWAY SURFACE	PAVED
EMBANKMENT TOP WIDTH	14.00 ft
CREST LENGTH	14.00 ft
OVERTOPPING CREST ELEVATION	91.00 ft

Spook Hill Floodway Tailwater Rating Curve
Rating Table for Trapezoidal Channel

Project Description	
Worksheet	Trapezoidal Channel - 1
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.030	
Slope	0.000200	ft/ft
Left Side Slope	2.00	H : V
Right Side Slope	2.00	H : V
Bottom Width	30.00	ft

Attribute	Minimum	Maximum	Increment
Discharge (cfs)	0.00	1,000.00	100.00

Discharge (cfs)	Depth (ft)	Velocity (ft/s)	Flow Area (ft^2)	Wetted Perimeter (ft)	Top Width (ft)
0.00	0.00	0.00	0.0	0.00	54.64
100.00	2.48	1.15	86.8	41.10	39.93
200.00	3.70	1.45	138.2	46.53	44.78
300.00	4.65	1.64	182.5	50.77	48.58
400.00	5.45	1.79	222.9	54.38	51.80
500.00	6.16	1.92	260.7	57.55	54.64
600.00	6.80	2.02	296.6	60.42	57.21
700.00	7.39	2.12	330.9	63.05	59.56
800.00	7.94	2.20	364.0	65.49	61.74
900.00	8.45	2.27	396.0	67.77	63.78
1,000.00	8.93	2.34	427.2	69.92	65.71

Table 1. Stage-Discharge Function (WPA)

Stage NAVD 88 (ft)	Discharge (cfs)
1576.0	0
1578.0	0
1580.0	10
1581.0	180
1582.0	367
1583.0	595
1583.9	800
1585.0	1231
1586.0	2625
1592.0	24500

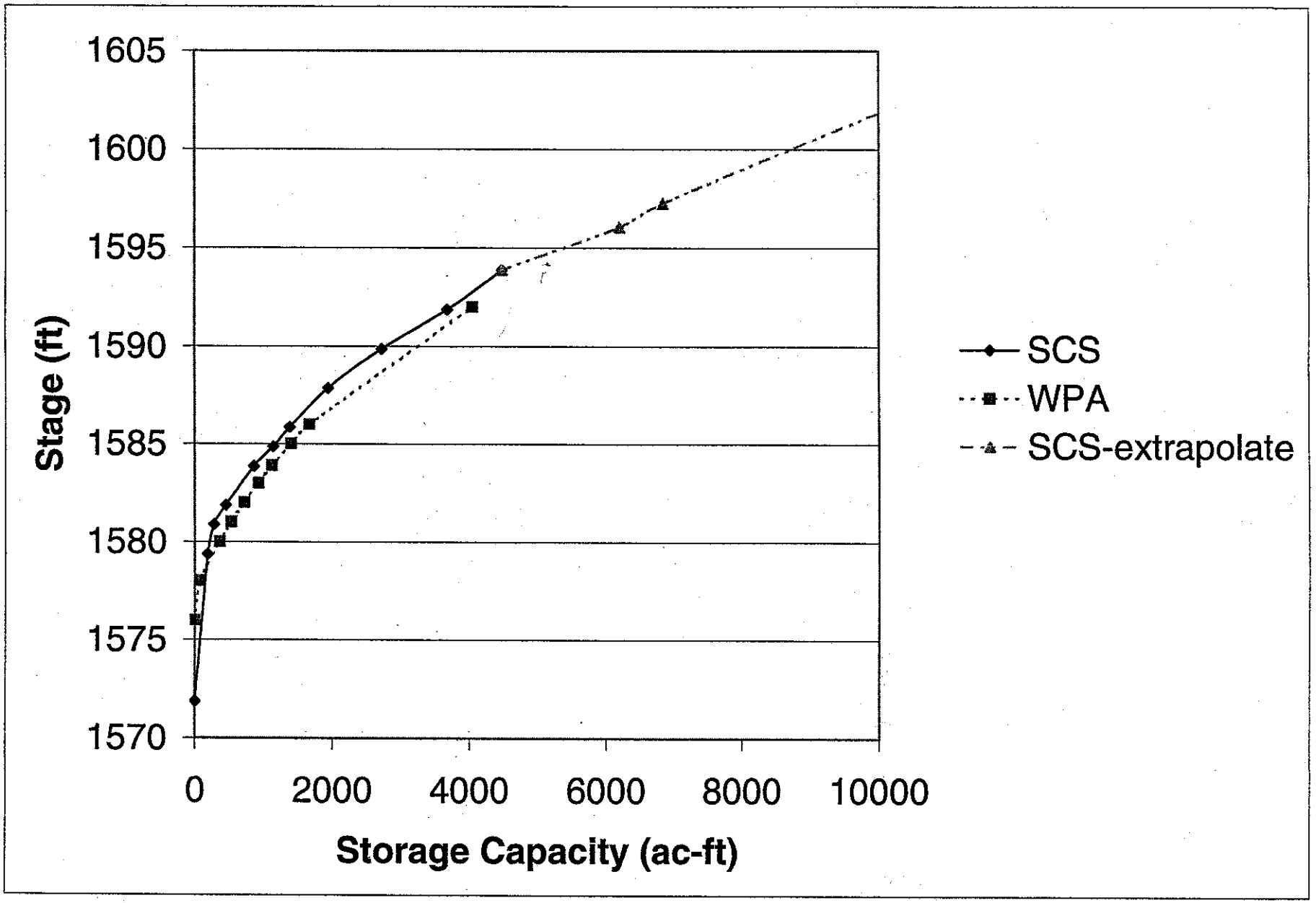
Table 2. Stage-Discharge Function (SCS-As Built Plans)

Stage NGVD 29 (ft)	Stage NAVD 88 (ft)	Discharge (cfs)
1577.5	1579.36	0
1579	1580.86	500
1580	1581.86	800
1582	1583.86	950
1583	1584.86	1700
1584	1585.86	3300
1586	1587.86	7000
1588	1589.86	12300
1590	1591.86	19200
1592	1593.86	26700
1594.2	1596.06	40000
1595.4	1597.26	45000

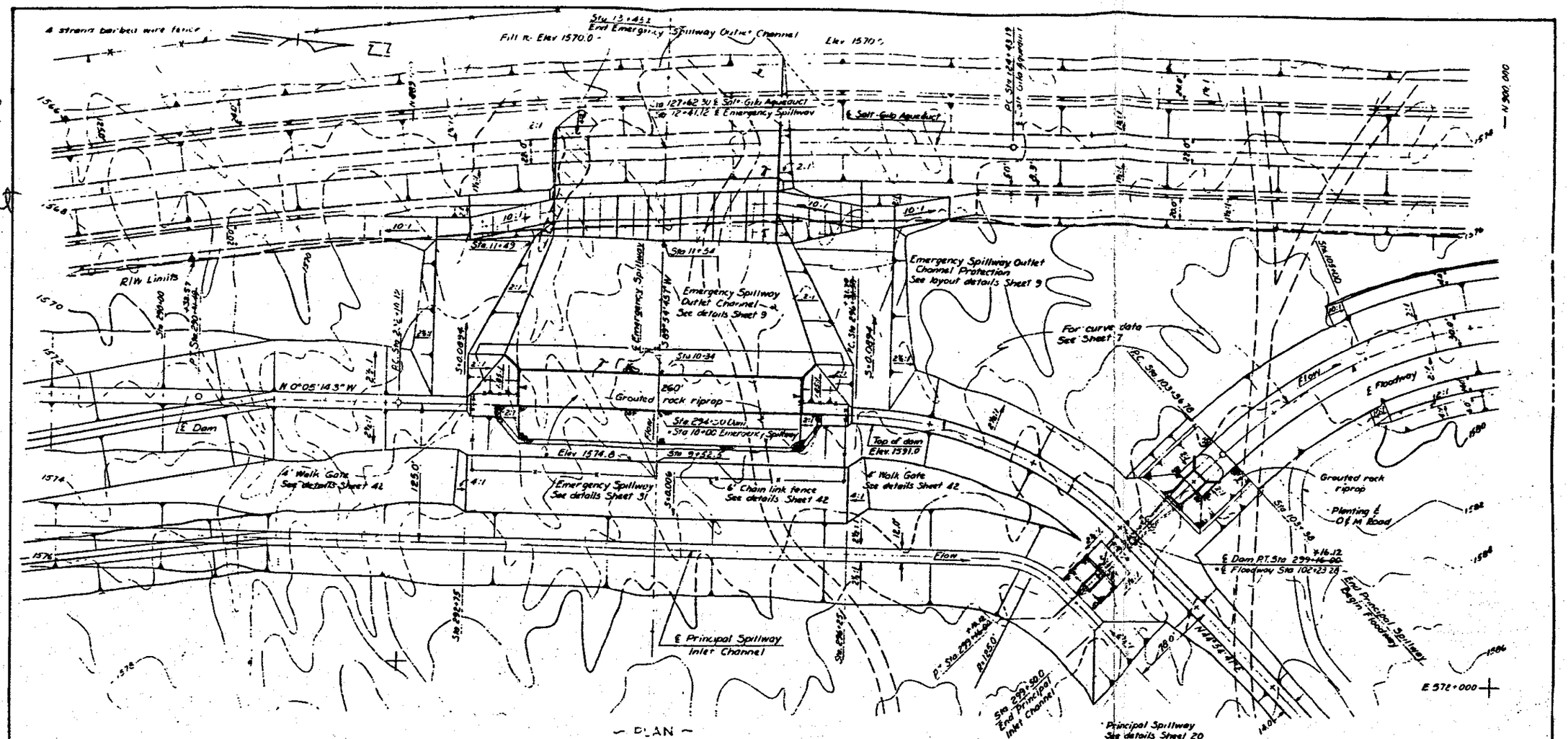
Table 3. Stage-Discharge Function (DMJM)

Stage NGVD 29 (ft)	Stage NAVD 88 (ft)	Principal Spillway (cfs)	Emergency Spillway (cfs)	Total Discharge (cfs)
1577.5	1579.36	0		0
1579	1580.86	310		310
1580	1581.86	466		466
1582	1583.86	643	0	643
1583	1584.86	711	684	1395
1584	1585.86	773	1,934	2707
1586	1587.86	897	5,470	6367
1588	1589.86	997	10,050	11046
1590	1591.86	1087	15,473	16560
1592	1593.86	1187	21,624	22811
1593	1594.86	1227	24,947	26174
1594.2	1596.06	1266	28,425	29691
1595.4	1597.26	1322	32,051	33373
1596	1597.86	1359	35,820	37179
1597	1598.86	1395	39,725	41121
1598	1599.86	1431	43,763	45194
1599	1600.86	1465	47,929	49395
1600	1601.86	1499	52,220	53719

Cw = 4
B = 42'


1605
1600
1595
1590
1585
1580
1575
1570
Stage (ft)
0
2000
4000
6000
8000
10000
Storage Capacity (ac-ft)
SCS
WPA
SCS-extrapolate

Sediment vol.?
in curve
what's different



AS BUILT

PLAN OF SPILLWAYS
SPOOK HILL F.R.S.
BUCKHORN-MESA WPP
MARICOPA & PINAL COUNTIES, ARIZONA

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Designed JLS, DJM 8-75
Traced E.S. 9-75
Checked F.H. 12-76
Approved by
Date
Scale 1" = 45,000
Drawing No. 7-E-23797

THUNDER MOUNTAIN SOUTH CHANNEL

TRAPEZOIDAL CHANNEL ANALYSIS
NORMAL DEPTH COMPUTATION

September 26, 2002

PROGRAM INPUT DATA

DESCRIPTION	VALUE
Flow Rate (cfs)	154.0
Channel Bottom Slope (ft/ft)	0.02
Manning's Roughness Coefficient (n-value)	0.03
Channel Left Side Slope (horizontal/vertical)	3.0
Channel Right Side Slope (horizontal/vertical)	3.0
Channel Bottom Width (ft)	20.0

COMPUTATION RESULTS

DESCRIPTION	VALUE
Normal Depth (ft)	1.03
Flow Velocity (fps)	6.5
Froude Number	1.204
Velocity Head (ft)	0.66
Energy Head (ft)	1.68
Cross-Sectional Area of Flow (sq ft)	23.7
Top Width of Flow (ft)	26.16

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Phone:(281)440-3787, Fax:(281)440-4742, Email:software@dodson-hydro.com
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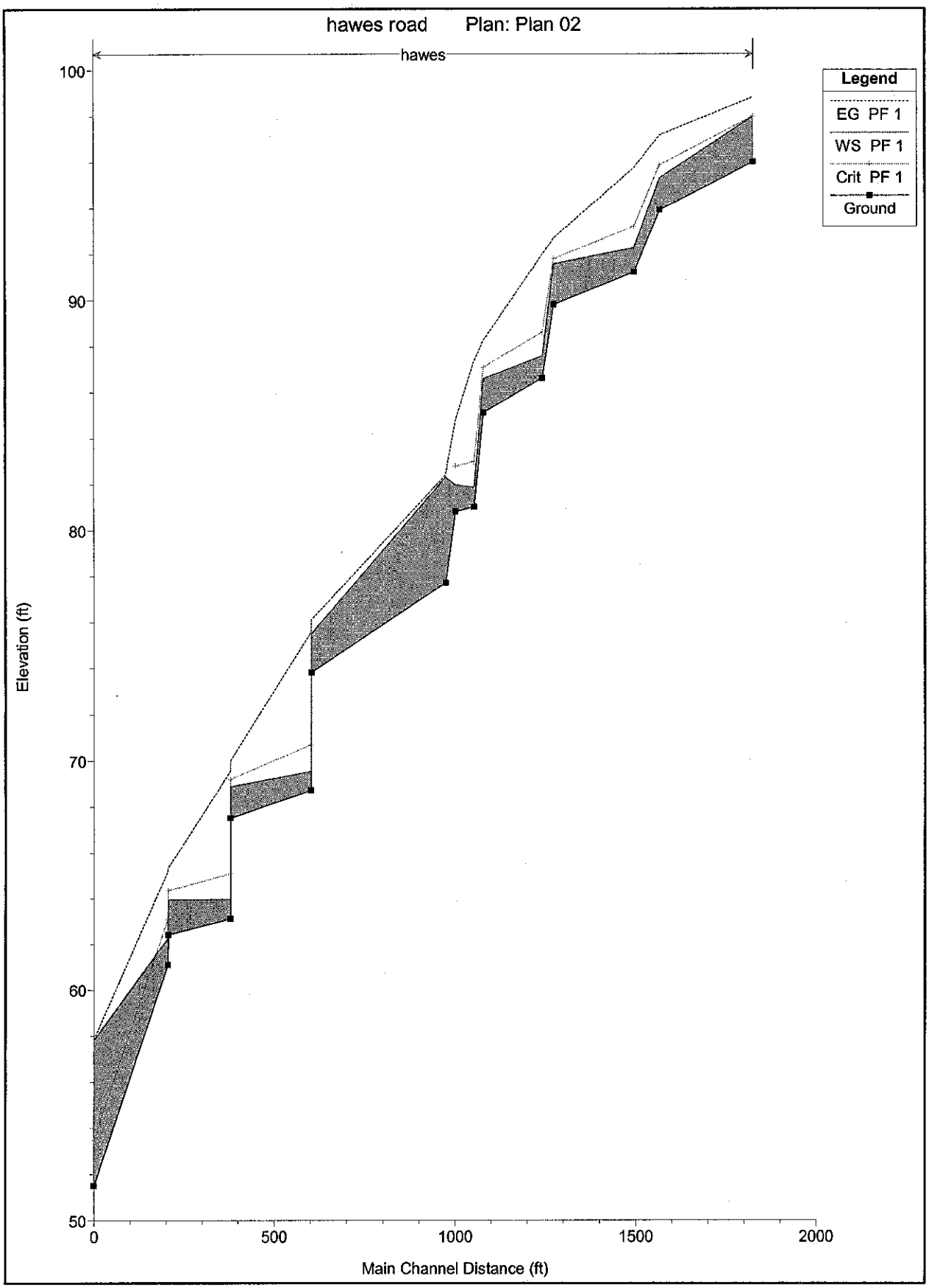
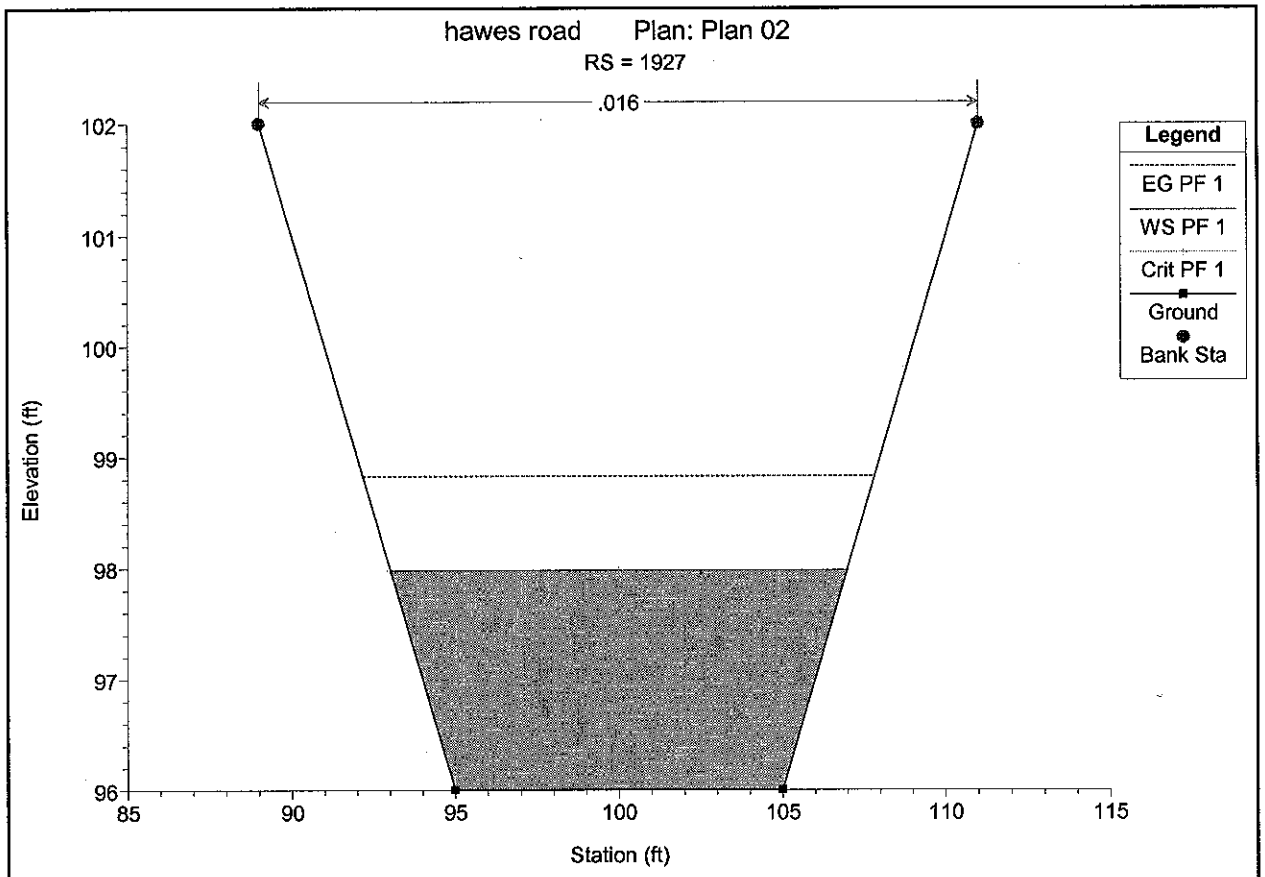
THUNDER MOUNTAIN WEST CHANNEL



HEC-RAS Plan: Plan 02 River: hawes Reach: hawes Profile: PF 1

Reach	River Sta	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
		(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
hawes	1927	175.00	96.00	97.98	97.98	98.83	0.003623	7.39	23.69	13.96	1.00
hawes	1667	175.00	93.90	95.30	95.87	97.17	0.011677	10.97	15.95	12.80	1.73
hawes	1596	175.00	91.20	92.26	93.18	95.75	0.030059	15.00	11.67	12.11	2.69
hawes	1374	175.00	89.80	91.56	91.77	92.67	0.005394	8.46	20.69	13.52	1.21
hawes	1342	175.00	86.60	87.55	88.58	91.96	0.043071	16.86	10.38	11.90	3.18
hawes	1179	175.00	85.10	86.58	87.07	88.23	0.009684	10.30	16.98	12.96	1.59
hawes	1153	175.00	81.00	81.86	82.98	87.33	0.059993	18.78	9.32	11.72	3.71
hawes	1101	175.00	80.80	81.96	82.77	84.78	0.021641	13.46	13.00	12.33	2.31
hawes	1074	175.00	77.70	82.30		82.41	0.000189	2.61	67.16	19.20	0.25
hawes	703	175.00	73.80	75.48	75.48	76.08	0.003635	6.24	28.05	23.42	1.00
hawes	702	175.00	68.70	69.52	70.67	75.53	0.069331	19.67	8.89	11.64	3.97
hawes	480	175.00	67.50	68.86	69.18	69.98	0.008342	8.49	20.61	20.23	1.48
hawes	479	175.00	63.10	63.95	65.07	69.52	0.061593	18.94	9.24	11.70	3.76
hawes	306	175.00	62.40	63.95	64.34	65.33	0.007790	9.43	18.55	13.95	1.44
hawes	305	175.00	61.10	62.25	63.08	65.16	0.022883	13.71	12.76	12.29	2.37
hawes	100	175.00	51.50	57.80	53.47	57.85	0.000059	1.70	102.69	22.60	0.14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RS = 1927
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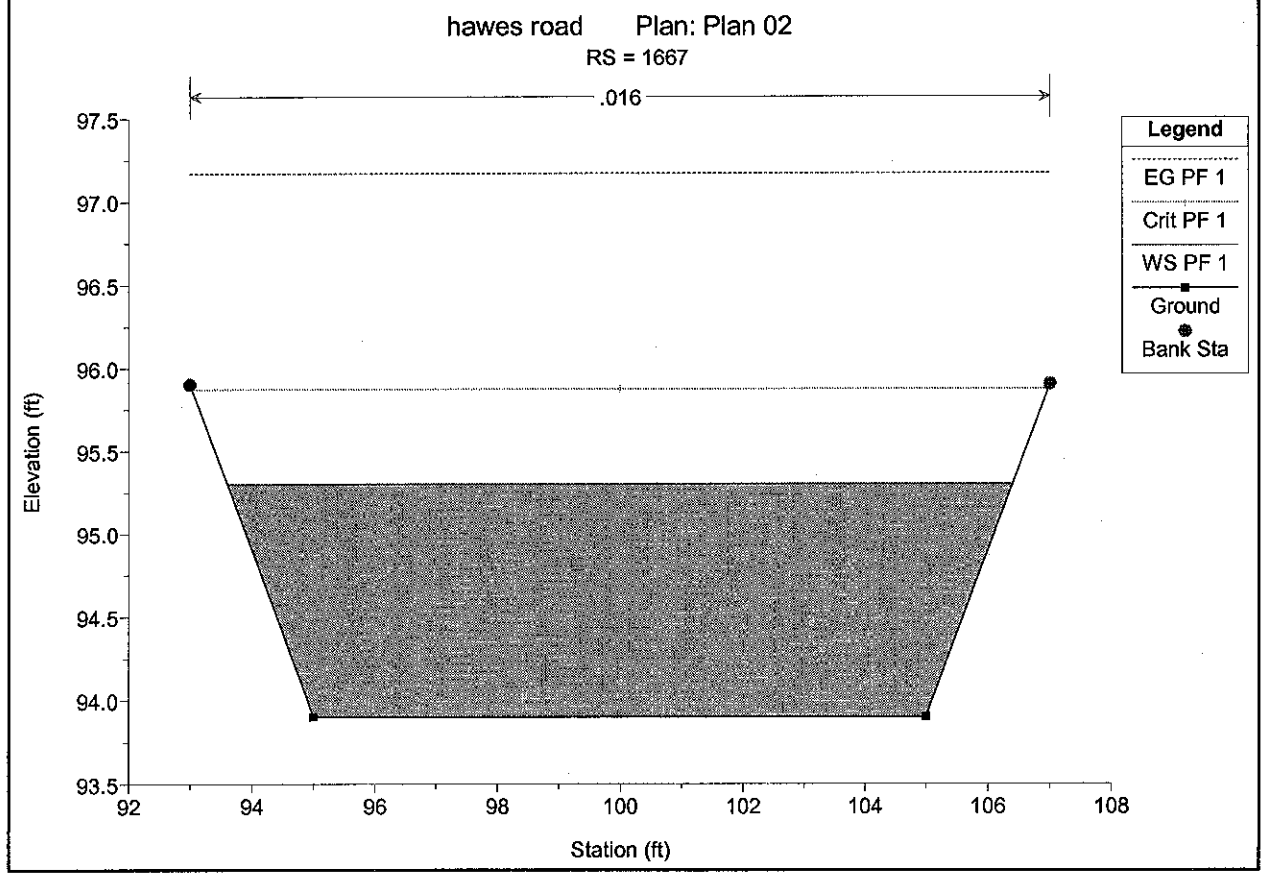
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
102
101
100
99
98
97
96
85
90
95
100
105
110
115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Crit PF 1
WS PF 1
Ground
Bank Sta
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Station (ft)
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93.5
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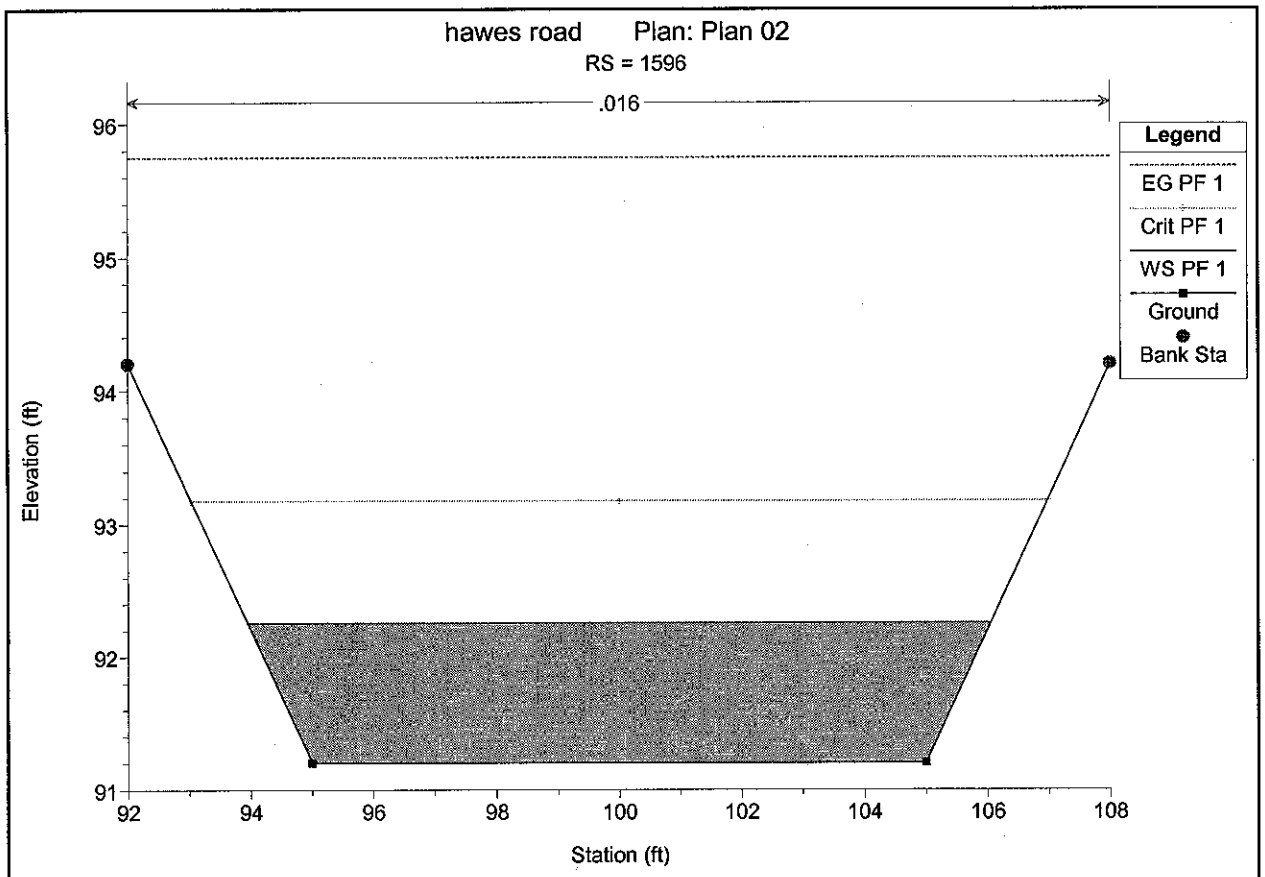
98
100
102
104
106
108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EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
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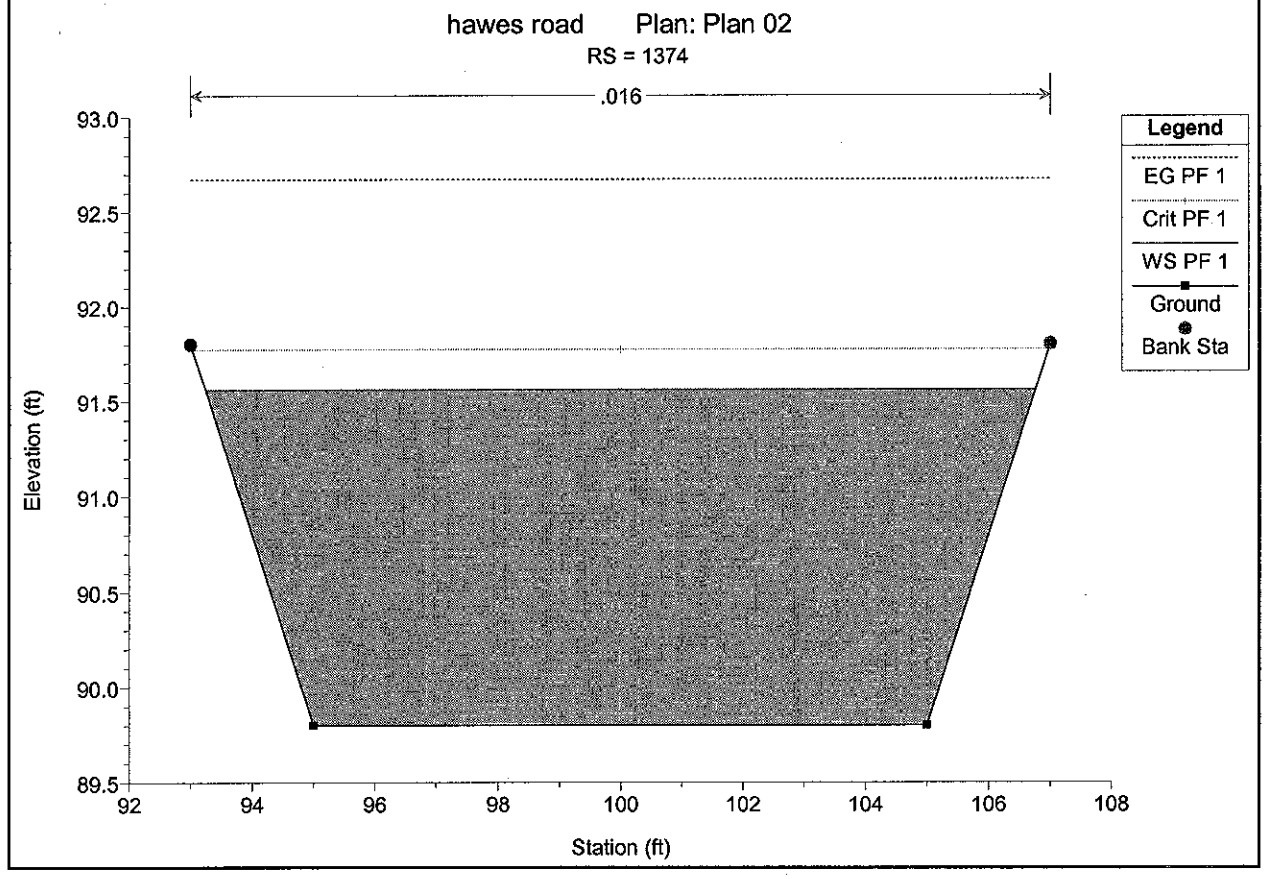
95
94
93
92
91
92
94
96
98
100
102
104
106
108
Station (ft)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Crit PF 1
WS PF 1
Ground
Bank Sta
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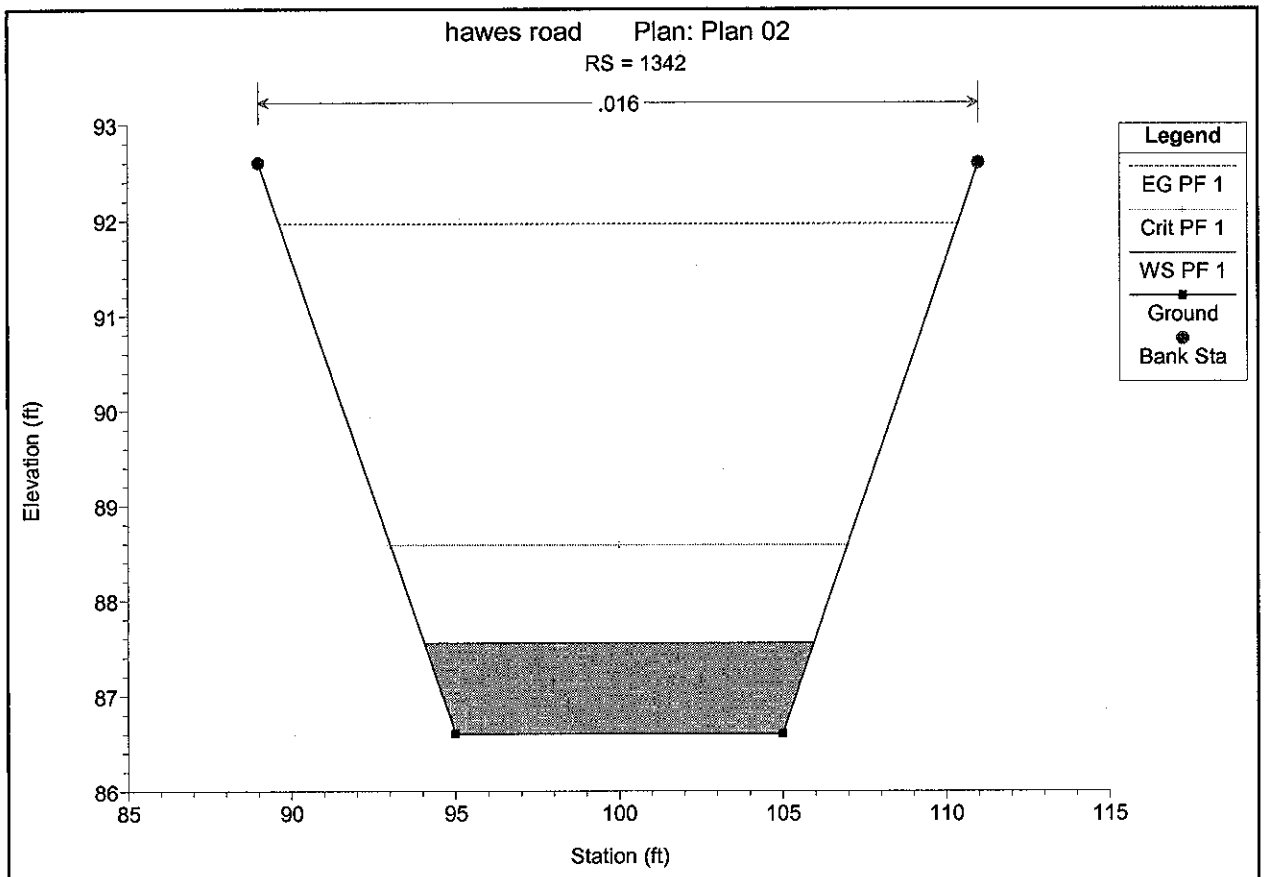
102
104
106
108
Station (ft)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Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
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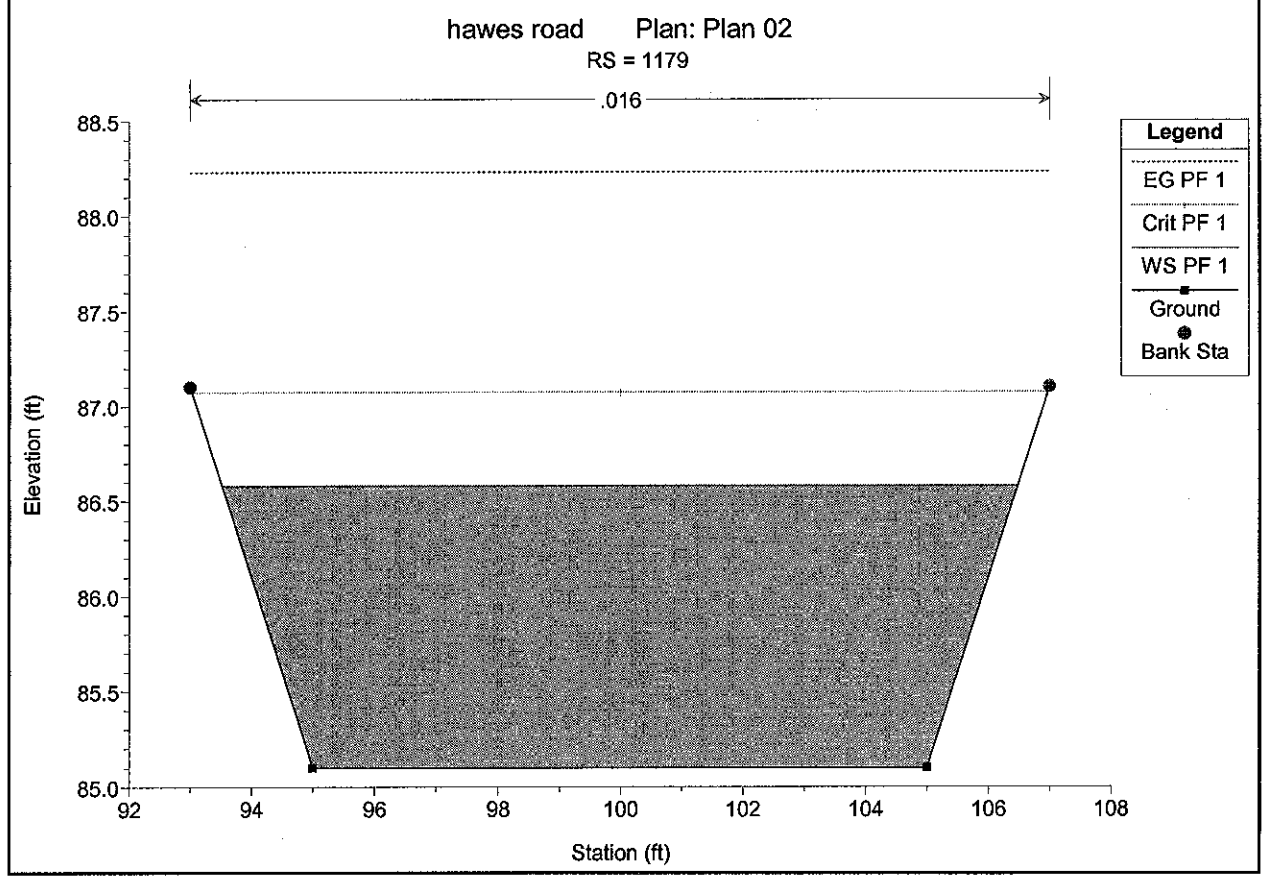
92
91
90
89
88
87
86
85
90
95
100
105
110
115
Station (ft)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Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
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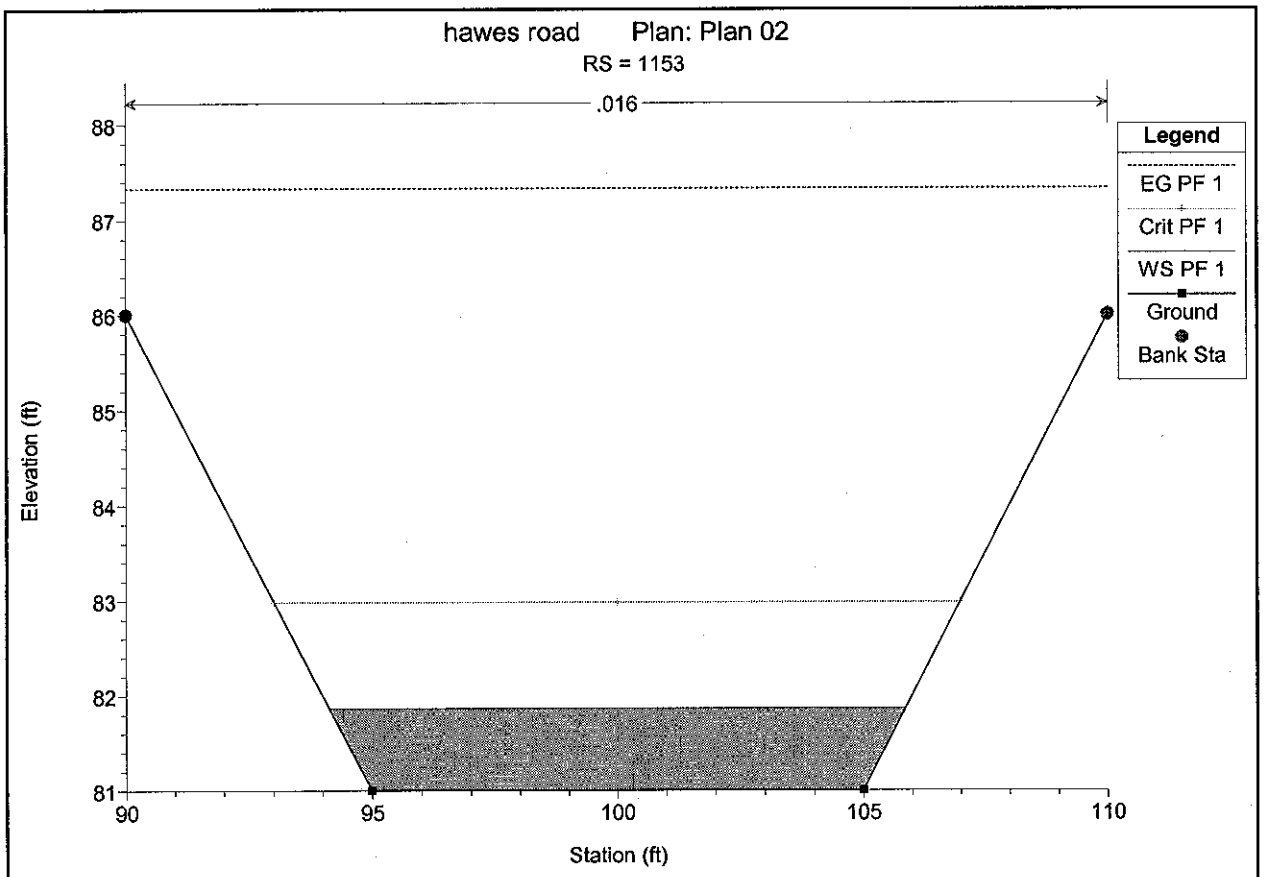
88.0
87.5
87.0
86.5
86.0
85.5
85.0
92
94
96
98
100
102
104
106
108
Station (ft)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EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
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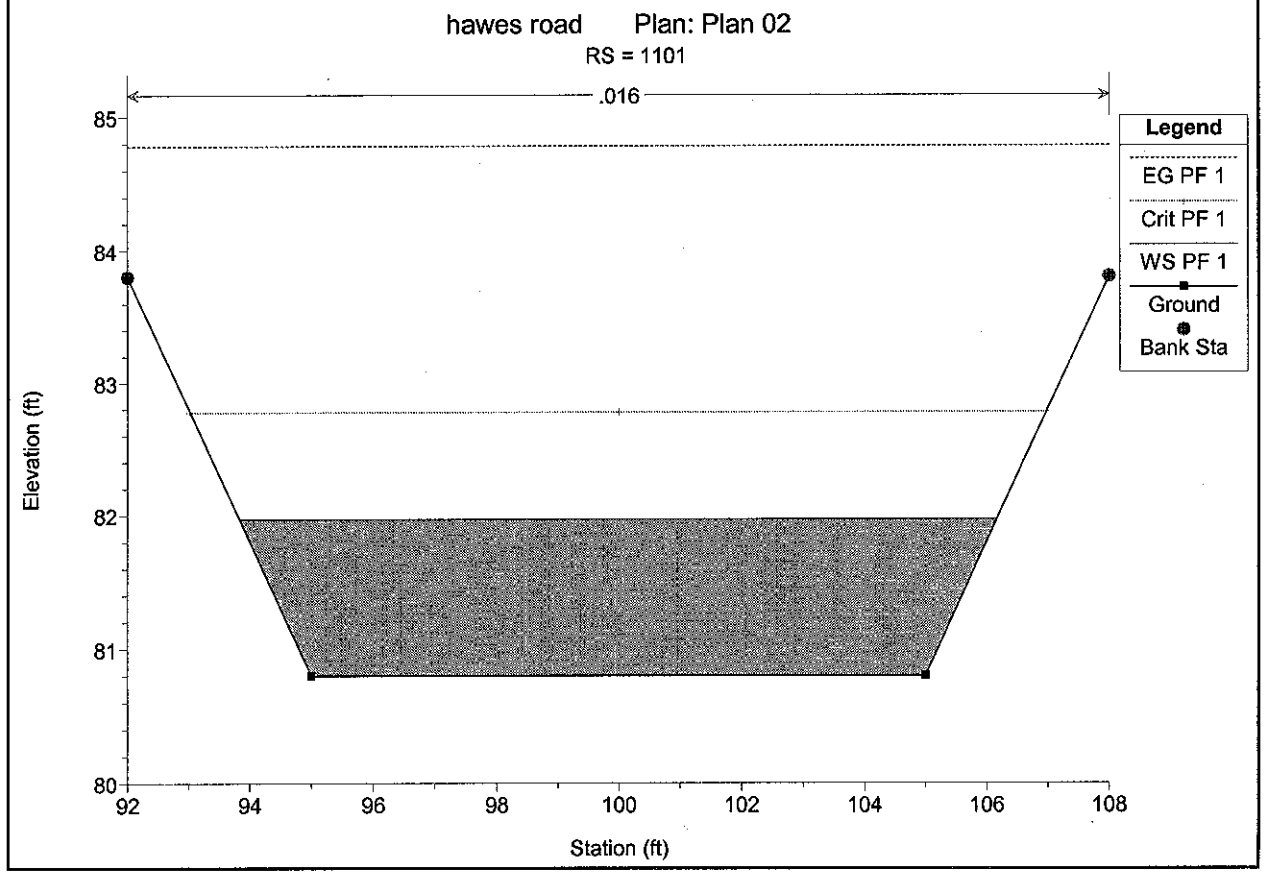
87
86
85
84
83
82
81
90
95
100
105
110
Station (ft)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Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
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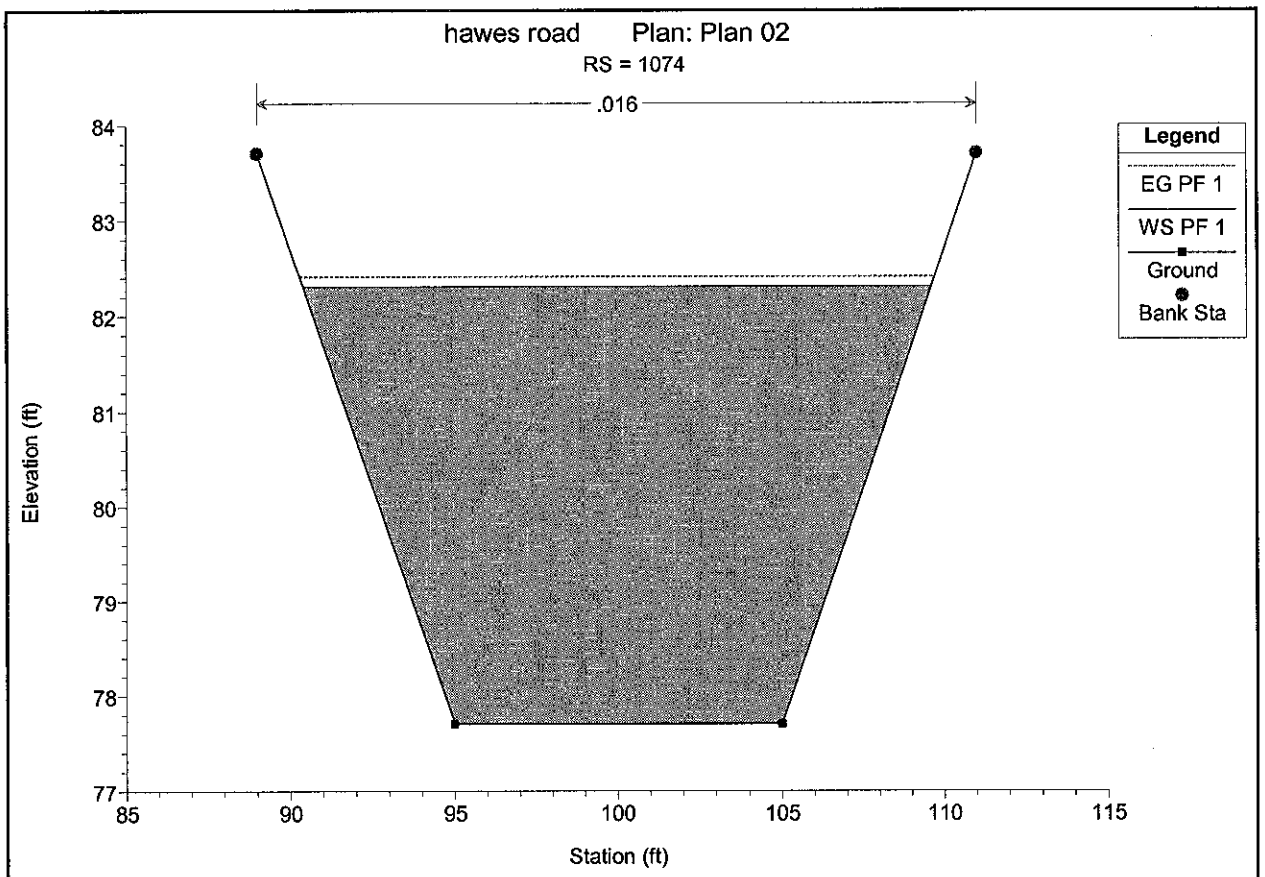
84
83
82
81
80
92
94
96
98
100
102
104
106
108
Station (ft)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Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
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83
82
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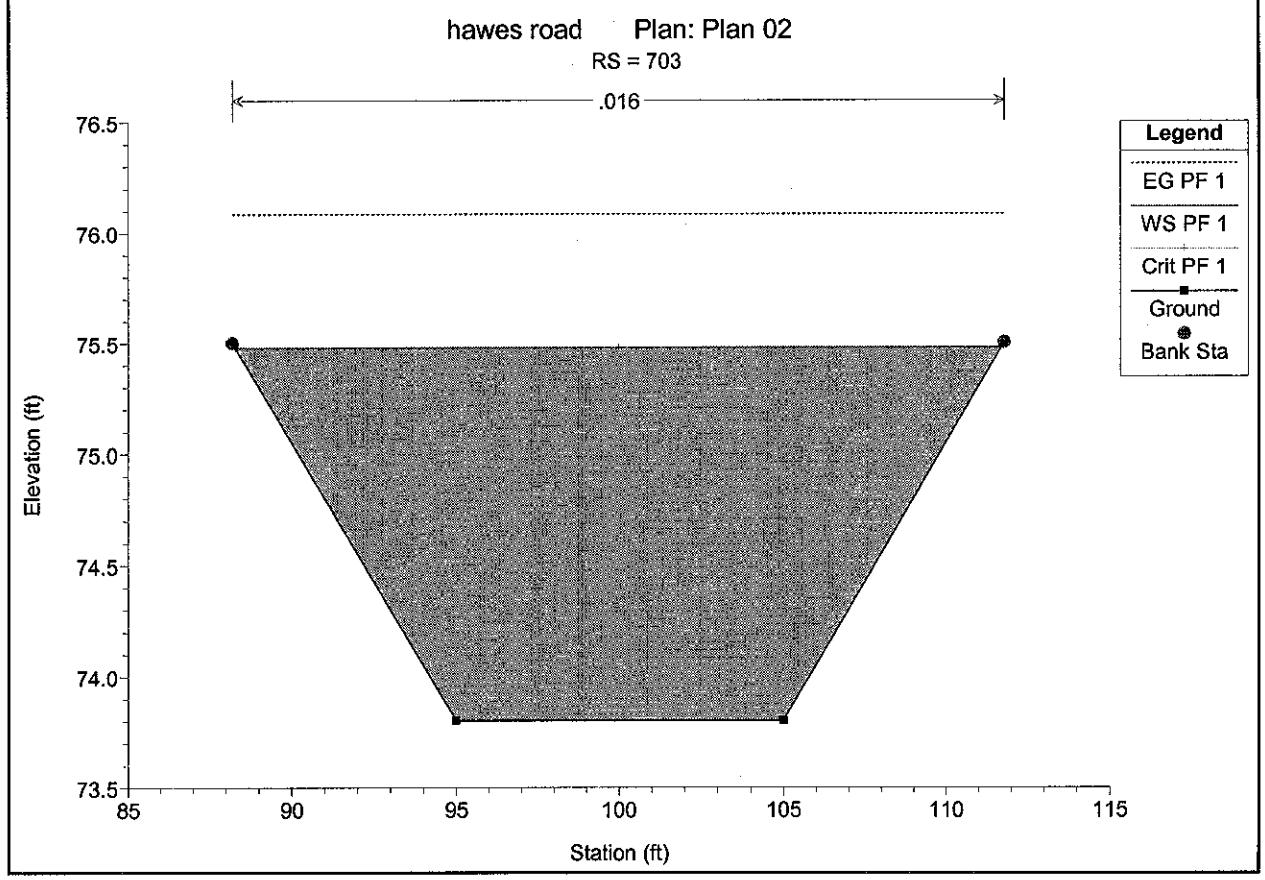
100
105
110
115
Station (ft)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WS PF 1
Crit PF 1
Ground
Bank Sta
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74.0
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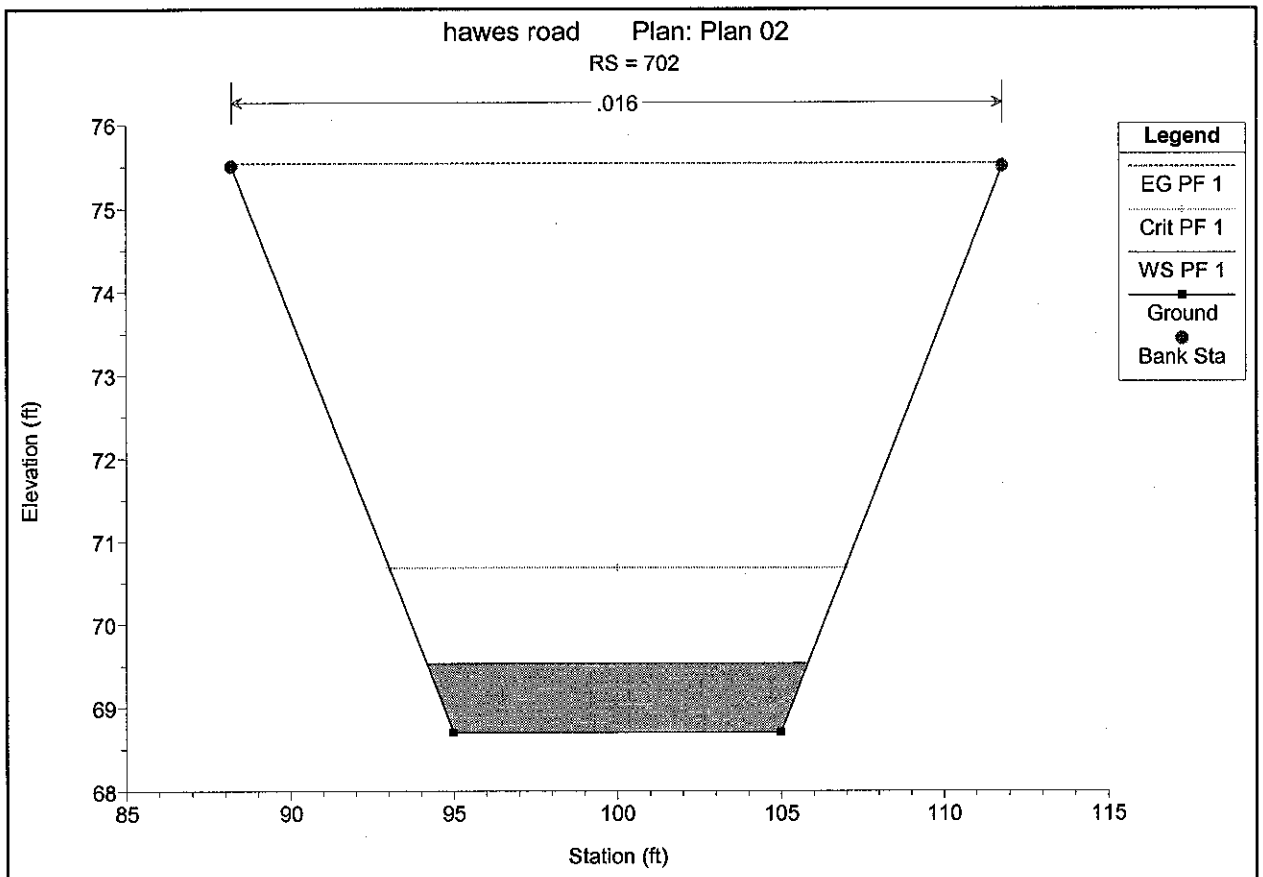
85
90
95
100
105
110
115
Station (ft)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Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
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75
74
73
72
71
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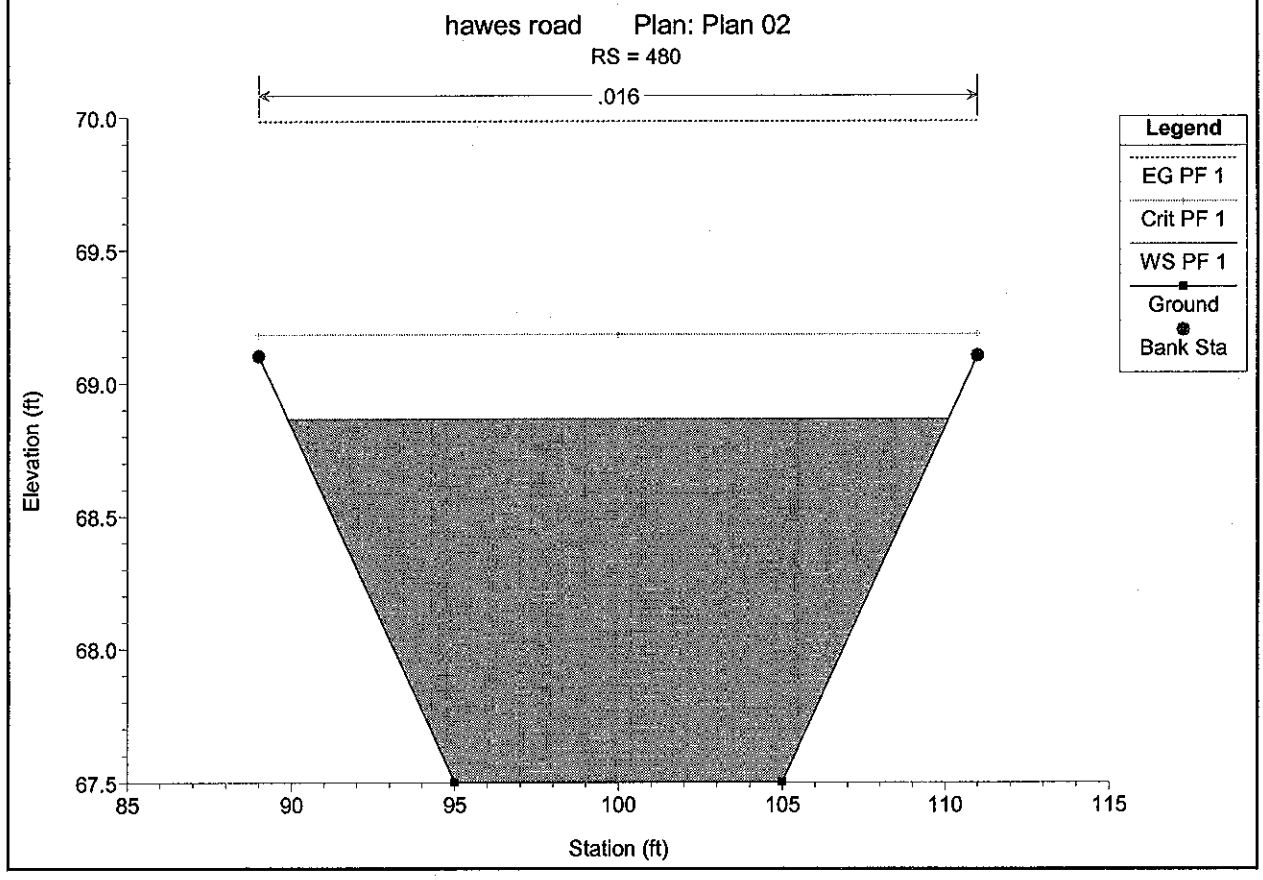
69
68
85
90
95
100
105
110
115
Station (ft)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WS PF 1
Ground
Bank Sta
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67.5
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95
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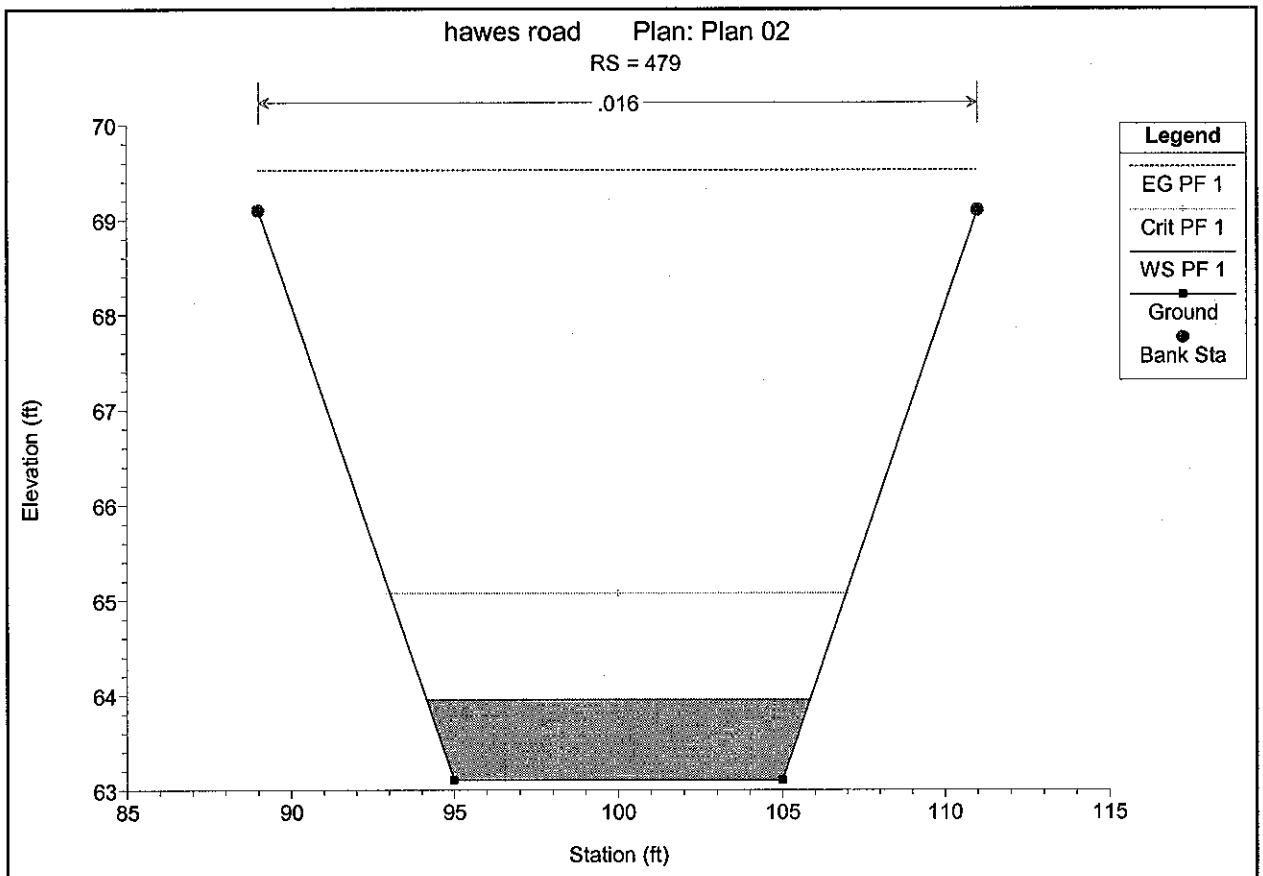
Station (ft)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Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
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69
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67
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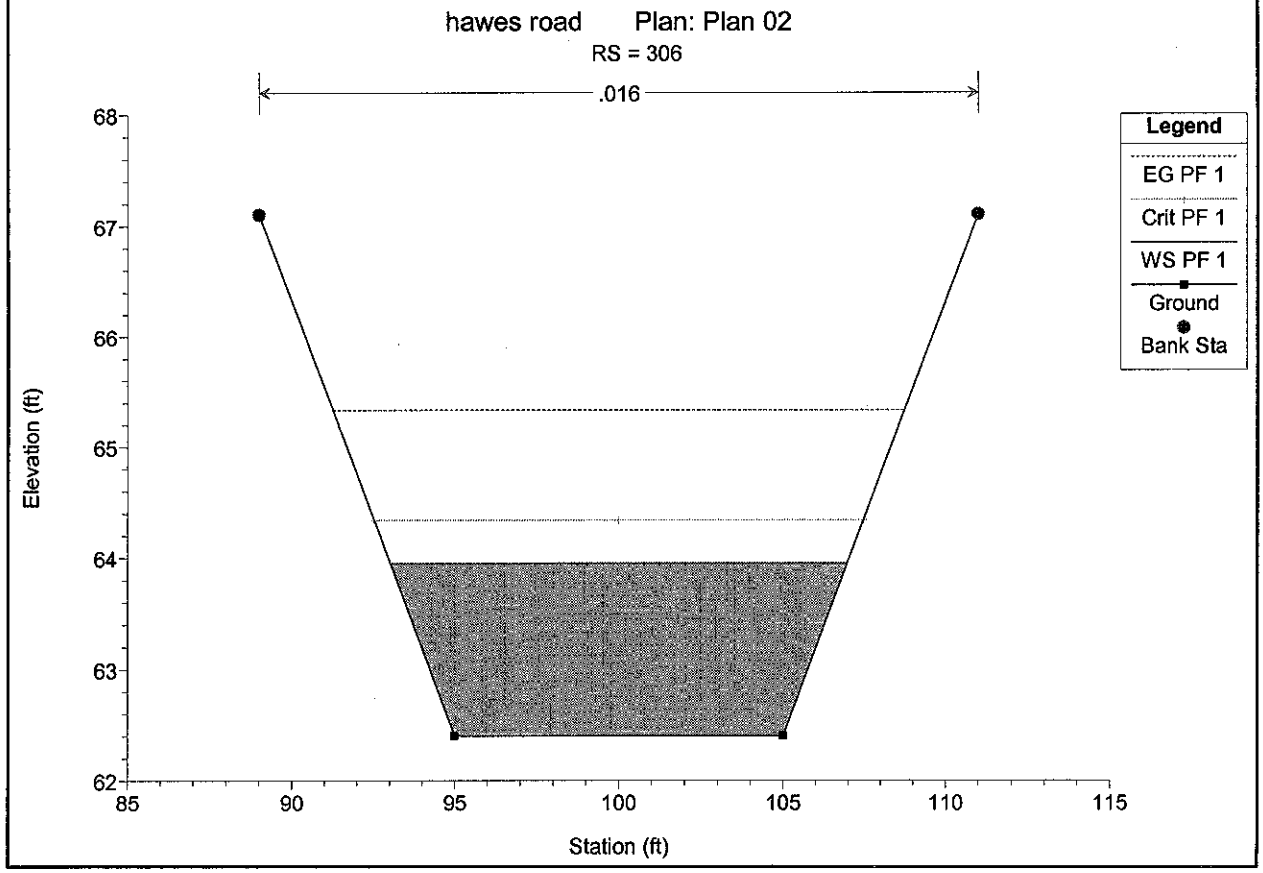
65
64
63
85
90
95
100
105
110
115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EG PF 1
Crit PF 1
WS PF 1
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Bank Sta
Elevation (ft)
Station (ft)
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67
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85
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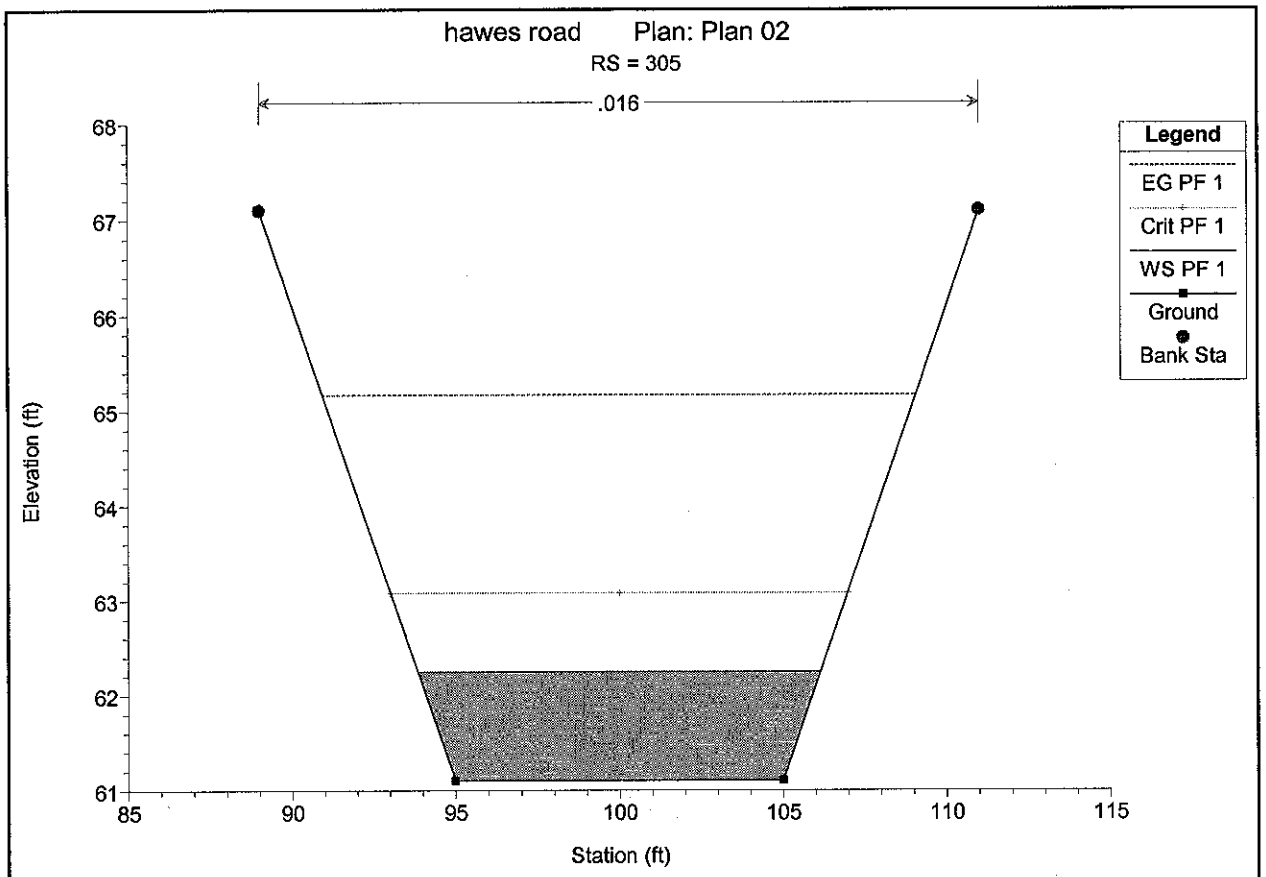
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Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
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63
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61
85
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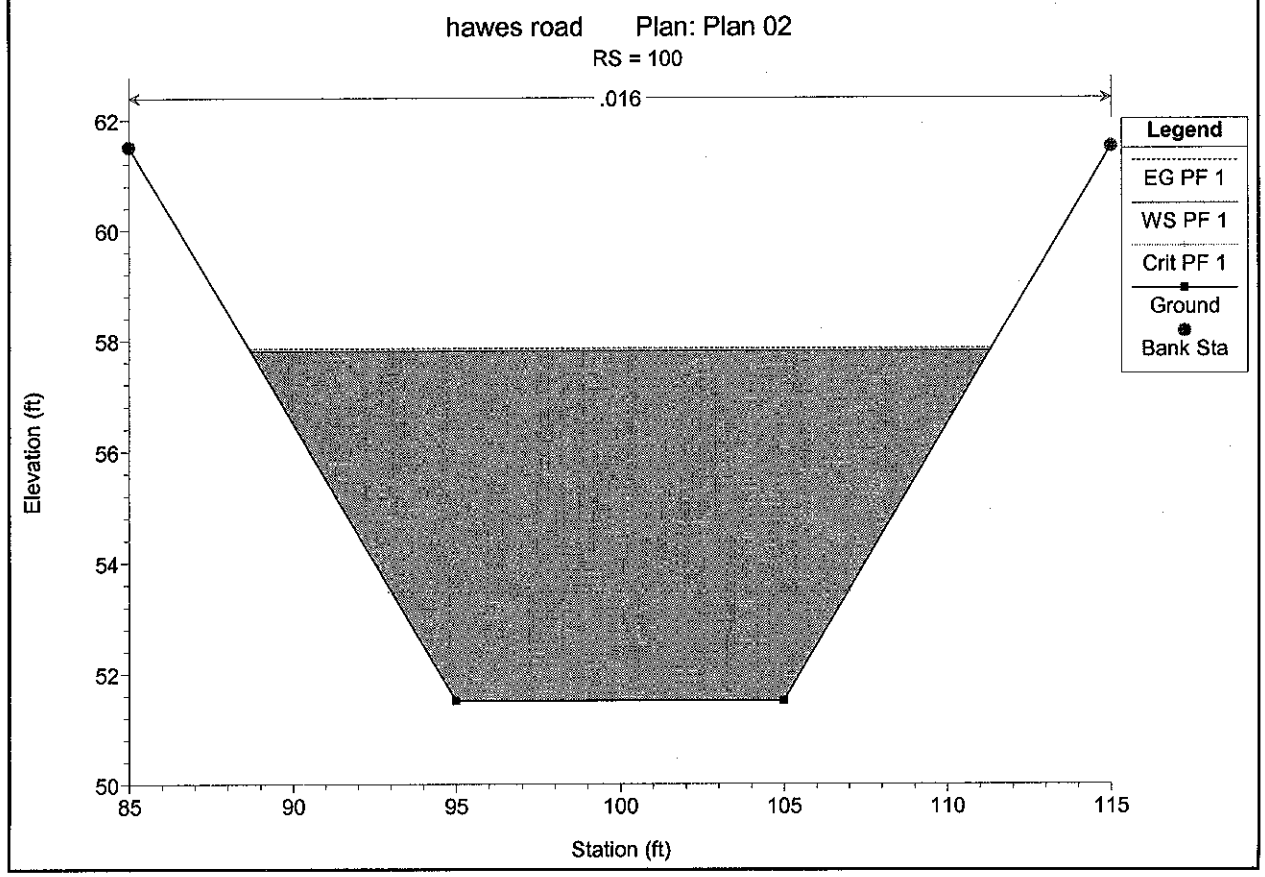
hawes road Plan: Plan 02
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Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
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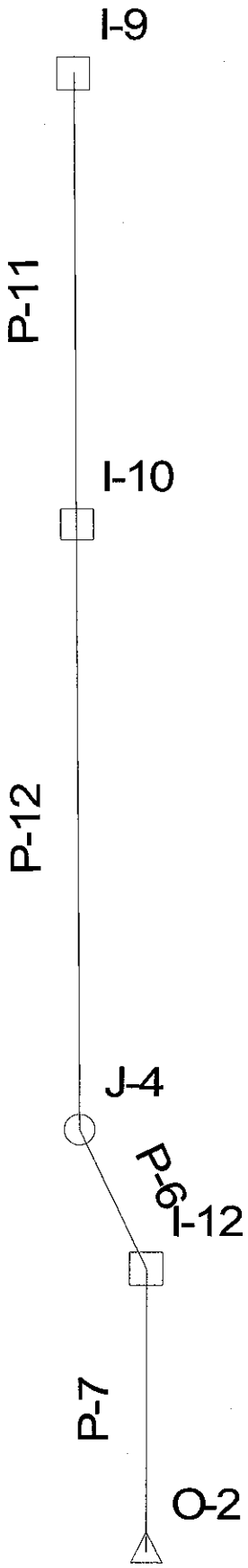
60
58
56
54
52
50
85
90
95
100
105
110
115

Scenario: Base

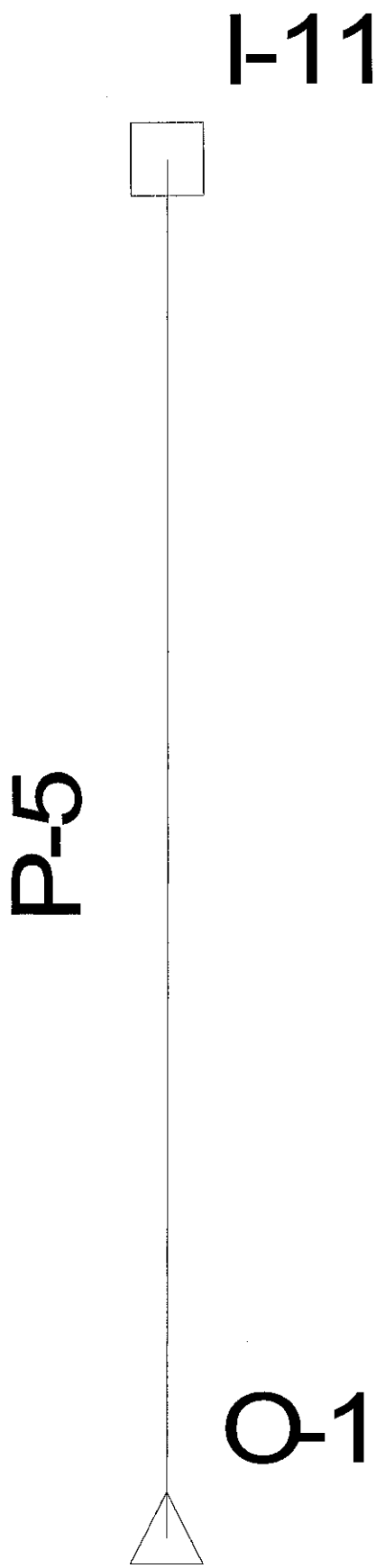


Scenario: Base

Pipe Report

Label	Upstream Node	Downstream Node	Total System Flow (cfs)	Length (ft)	Constructed Slope (ft/ft)	Number of Sections	Section Size	Mannings n	Average Velocity (ft/s)	Upstream Invert Elevation (ft)	Downstream Invert Elevation (ft)	Hydraulic Grade Line In (ft)	Hydraulic Grade Line Out (ft)
P-11	I-9	I-10	8.00	281.00	0.003559	1	24 inch	0.023	2.73	1,835.00	1,834.00	1,836.75	1,835.77
P-12	I-10	J-4	25.00	378.00	0.023810	1	30 inch	0.023	6.05	1,834.00	1,825.00	1,835.70	1,828.80
P-6	J-4	I-12	25.00	96.00	0.020833	1	30 inch	0.023	5.09	1,825.00	1,823.00	1,828.77	1,827.66
P-7	I-12	O-2	71.00	176.00	0.011364	1	48 inch	0.023	5.65	1,823.00	1,821.00	1,827.61	1,826.26

Scenario: Base

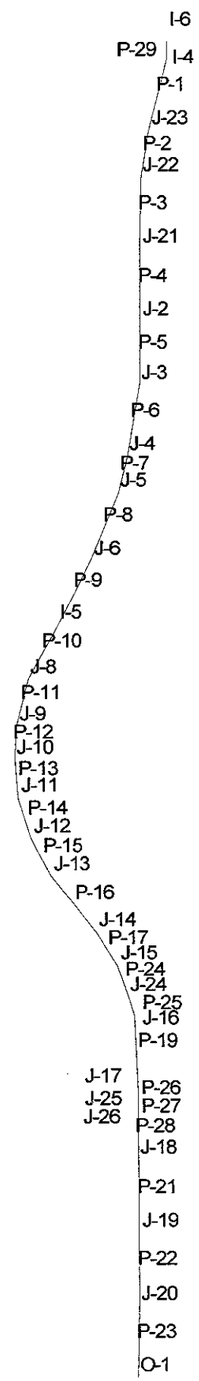


Scenario: Base

Pipe Report

Label	Upstream Node	Downstream Node	Total System Flow (cfs)	Length (ft)	Constructed Slope (ft/ft)	Number of Sections	Section Size	Mannings n	Average Velocity (ft/s)	Upstream Invert Elevation (ft)	Downstream Invert Elevation (ft)	Hydraulic Grade Line In (ft)	Hydraulic Grade Line Out (ft)
P-5	I-11	O-1	N/A	382.00	0.024869	1	24 inch	0.013	N/A	1,821.00	1,811.50	N/A	N/A

Scenario: Base



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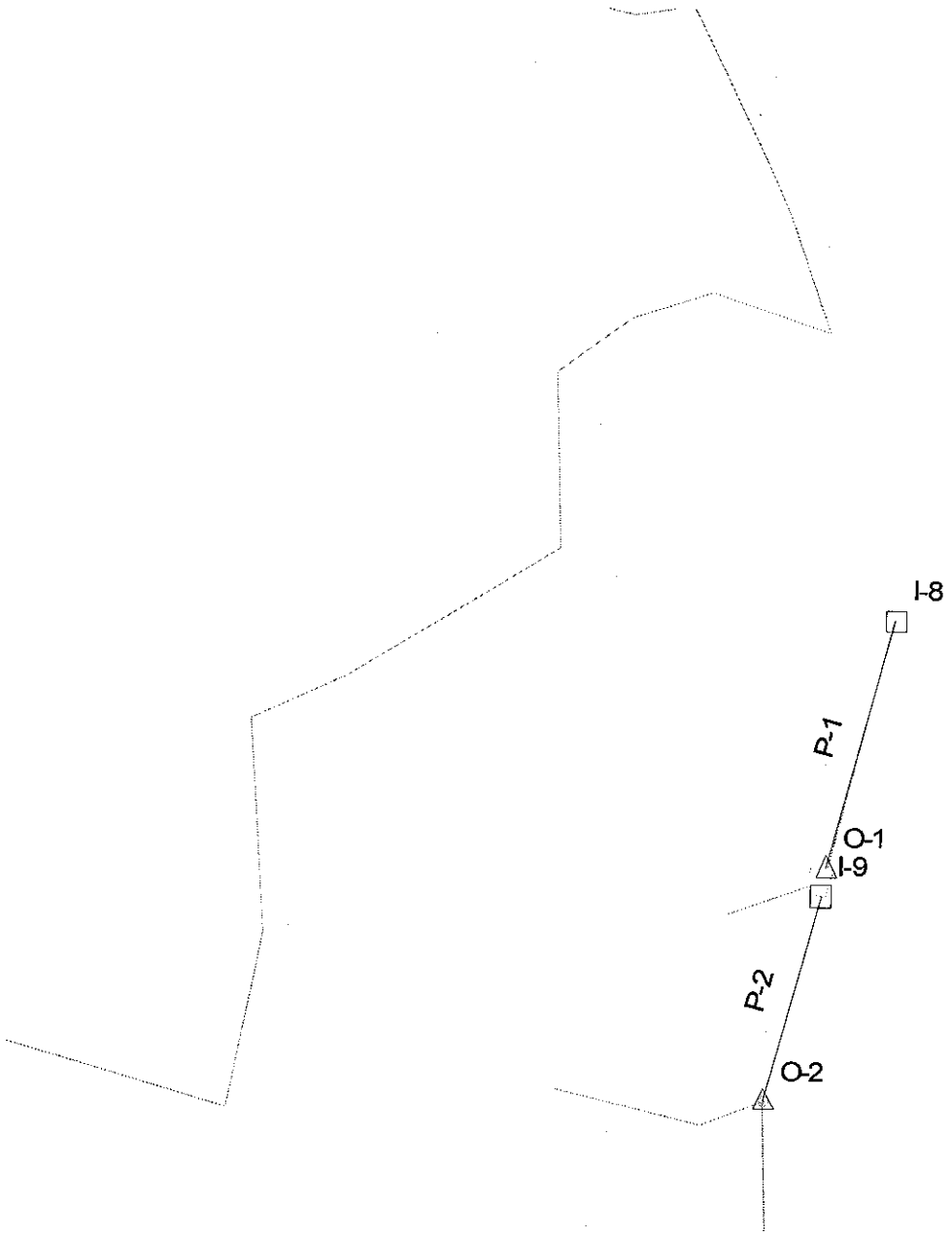
w:\...\fcdmc\ellsworth\ellsworthroad2.stm
09/26/02 11:20:37 AM

Scenario: Base

Pipe Report

Label	Upstream Node	Downstream Node	Total System Flow (cfs)	Length (ft)	Constructed Slope (ft/ft)	Number of Sections	Section Size	Mannings n	Average Velocity (ft/s)	Upstream Invert Elevation (ft)	Downstream Invert Elevation (ft)	Hydraulic Grade Line In (ft)	Hydraulic Grade Line Out (ft)
P-29	I-6	I-4	478.00	126.50	0.004743	1	84 inch	0.023	13.29	1,824.50	1,823.90	1,832.49	1,829.63
P-1	I-4	J-23	478.00	500.00	0.026800	1	78 inch	0.023	15.25	1,823.90	1,810.50	1,829.63	1,816.42
P-2	J-23	J-22	478.00	325.70	0.026405	1	78 inch	0.023	15.25	1,810.50	1,801.90	1,816.23	1,807.82
P-3	J-22	J-21	478.00	499.90	0.026405	1	78 inch	0.023	15.25	1,801.90	1,788.70	1,807.63	1,794.62
P-4	J-21	J-2	478.00	500.00	0.027800	1	78 inch	0.023	15.25	1,788.70	1,774.80	1,794.43	1,780.72
P-5	J-2	J-3	478.00	439.60	0.025250	1	78 inch	0.023	15.25	1,774.80	1,763.70	1,780.53	1,769.62
P-6	J-3	J-4	478.00	499.90	0.027606	1	78 inch	0.023	15.25	1,763.70	1,749.90	1,769.43	1,755.82
P-7	J-4	J-5	478.00	265.10	0.024142	1	78 inch	0.023	15.17	1,749.90	1,743.50	1,755.63	1,749.51
P-8	J-5	J-6	478.00	500.20	0.022991	1	78 inch	0.023	15.19	1,743.50	1,732.00	1,749.33	1,737.89
P-9	J-6	I-5	478.00	500.00	0.024200	1	84 inch	0.023	13.33	1,732.00	1,719.90	1,737.73	1,726.77
P-10	I-5	J-8	699.00	433.00	0.018476	1	96 inch	0.023	15.30	1,719.90	1,711.90	1,726.58	1,718.88
P-11	J-8	J-9	699.00	336.80	0.018409	1	96 inch	0.023	15.40	1,711.90	1,705.70	1,718.58	1,712.57
P-12	J-9	J-10	699.00	227.50	0.020220	1	96 inch	0.023	15.40	1,705.70	1,701.10	1,712.38	1,707.97
P-13	J-10	J-11	699.00	270.50	0.023660	1	96 inch	0.023	15.40	1,701.10	1,694.70	1,707.78	1,701.57
P-14	J-11	J-12	699.00	288.40	0.019071	1	96 inch	0.023	15.40	1,694.70	1,689.20	1,701.38	1,696.07
P-15	J-12	J-13	699.00	297.70	0.025193	1	96 inch	0.023	16.94	1,689.20	1,681.70	1,695.88	1,687.39
P-16	J-13	J-14	699.00	499.40	0.009411	1	10 x 5 f	0.013	16.05	1,681.70	1,677.00	1,686.70	1,680.86
P-17	J-14	J-15	699.00	276.90	0.003611	1	12 x 5 f	0.013	11.99	1,677.00	1,676.00	1,681.72	1,681.00
P-24	J-15	J-24	699.00	224.30	0.004458	1	12 x 5 f	0.013	11.99	1,676.00	1,675.00	1,680.72	1,680.00
P-25	J-24	J-16	699.00	137.60	0.021802	1	12 x 5 f	0.013	12.09	1,675.00	1,672.00	1,679.72	1,676.91
P-19	J-16	J-17	699.00	500.60	0.013983	1	12 x 5 f	0.013	12.18	1,672.00	1,665.00	1,676.72	1,669.84
P-26	J-17	J-25	699.00	98.90	0.020222	1	12 x 5 f	0.013	15.31	1,665.00	1,663.00	1,669.72	1,666.18
P-27	J-25	J-26	699.00	66.00	0.080303	1	12 x 5 f	0.013	11.99	1,663.00	1,657.70	1,667.72	1,664.57
P-28	J-26	J-18	699.00	334.30	0.017051	1	96 inch	0.023	15.22	1,657.70	1,652.00	1,664.57	1,658.87
P-21	J-18	J-19	699.00	500.20	0.020792	1	96 inch	0.023	15.40	1,652.00	1,641.60	1,658.68	1,648.47
P-22	J-19	J-20	699.00	499.70	0.021613	1	96 inch	0.023	15.40	1,641.60	1,630.80	1,648.28	1,637.67
P-23	J-20	O-1	699.00	500.00	0.021200	1	96 inch	0.023	16.28	1,630.80	1,620.20	1,637.48	1,626.31

Scenario: Base

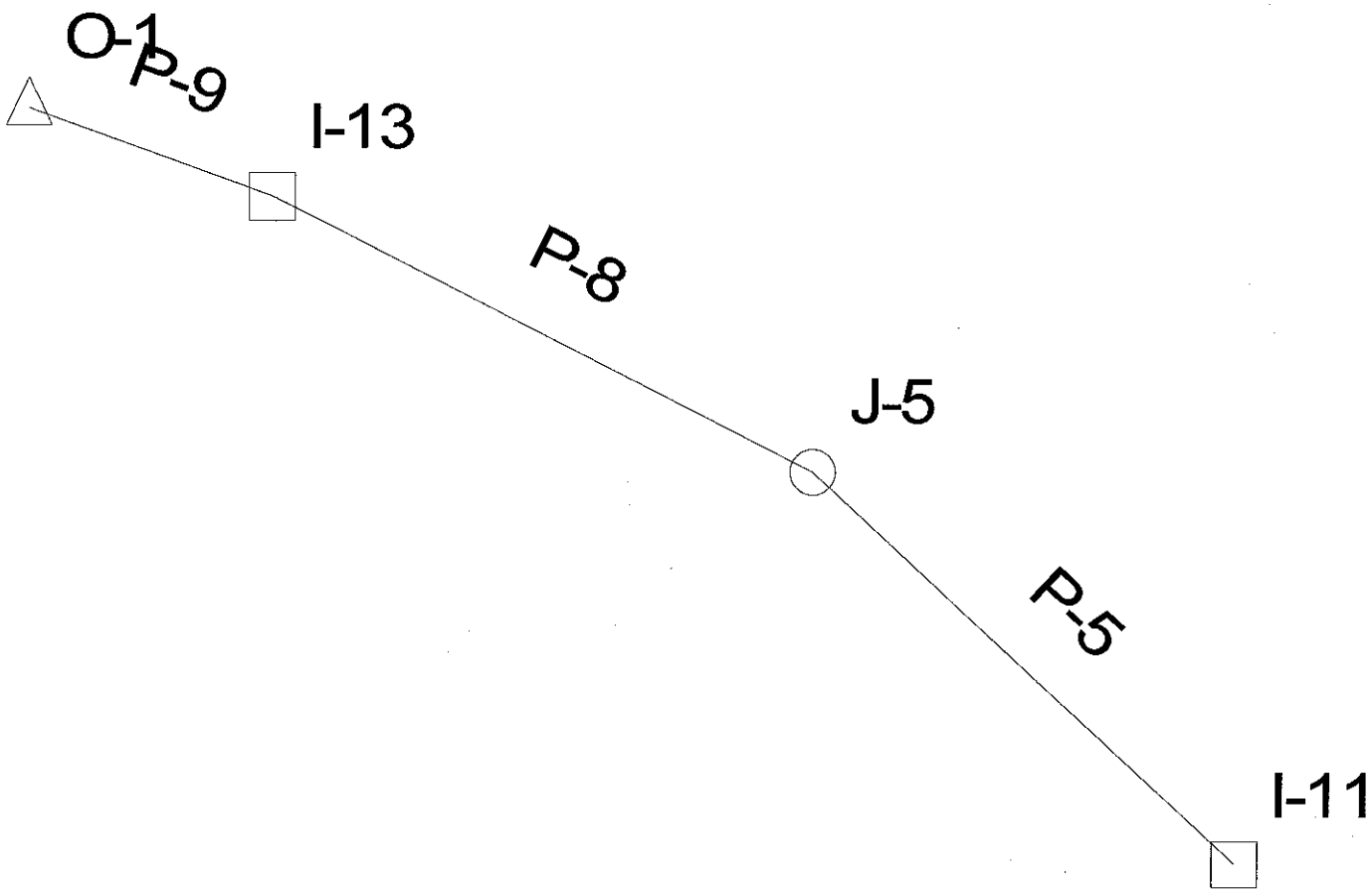


Scenario: Base

Pipe Report

Label	Upstream Node	Downstream Node	Total System Flow (cfs)	Length (ft)	Constructed Slope (ft/ft)	Number of Sections	Section Size	Mannings n	Average Velocity (ft/s)	Upstream Invert Elevation (ft)	Downstream Invert Elevation (ft)	Hydraulic Grade Line In (ft)	Hydraulic Grade Line Out (ft)
P-1	I-8	O-1	1,061.00	247.00	0.024291	2	84 inch	0.023	13.78	1,837.00	1,831.00	1,844.08	1,838.75
P-2	I-9	O-2	570.00	205.00	0.014634	1	102 inch	0.023	13.80	1,829.00	1,826.00	1,834.99	1,831.63

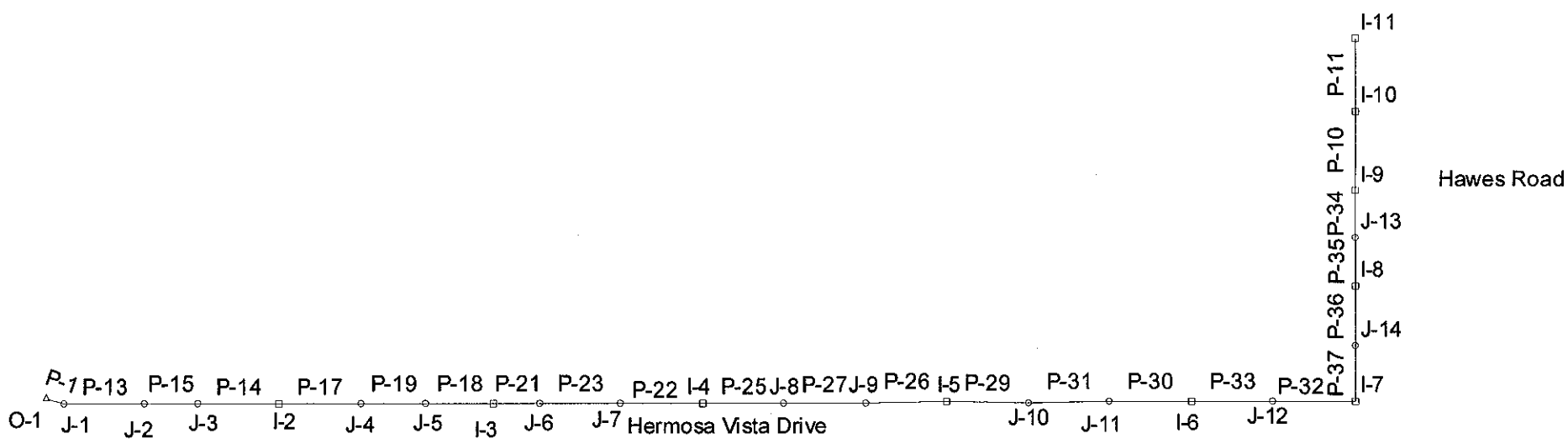
Scenario: Base



Scenario: Base

Pipe Report

Label	Upstream Node	Downstream Node	Total System Flow (cfs)	Length (ft)	Constructed Slope (ft/ft)	Number of Sections	Section Size	Mannings n	Average Velocity (ft/s)	Upstream Invert Elevation (ft)	Downstream Invert Elevation (ft)	Hydraulic Grade Line In (ft)	Hydraulic Grade Line Out (ft)
P-5	I-11	J-5	500.00	247.00	0.008097	2	78 inch	0.023	7.53	1,819.90	1,817.90	1,828.02	1,826.27
P-8	J-5	I-13	500.00	261.00	0.002682	2	78 inch	0.023	7.53	1,817.90	1,817.20	1,826.22	1,824.36
P-9	I-13	O-1	600.00	111.00	0.018018	2	78 inch	0.023	9.04	1,817.20	1,815.20	1,824.24	1,823.10

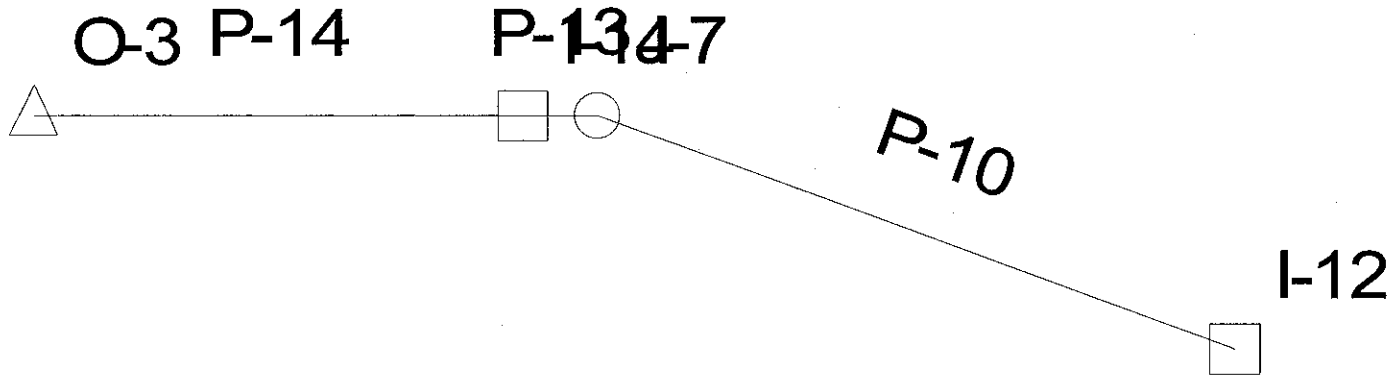

I-11
P-11
I-10
P-10
I-9
Hawes Road
P-34
J-13
P-35
I-8
P-36
J-14
P-37
I-7
P-13 P-15 P-14 P-17 P-19 P-18 P-21 P-23 P-22 I-4 P-25 J-8 P-27 J-9 P-26 I-5 P-29 P-31 P-30 P-33 P-32
O-1 J-1 J-2 J-3 I-2 J-4 J-5 I-3 J-6 J-7 Hermosa Vista Drive J-10 J-11 I-6 J-12

Scenario: Base

Pipe Report

Label	Upstream Node	Downstream Node	Total System Flow (cfs)	Length (ft)	Constructed Slope (ft/ft)	Number of Sections	Section Size	Mannings n	Average Velocity (ft/s)	Upstream Invert Elevation (ft)	Downstream Invert Elevation (ft)	Hydraulic Grade Line In (ft)	Hydraulic Grade Line Out (ft)
P-11	I-11	I-10	37.00	450.00	0.017778	1	36 inch	0.023	6.45	1,741.00	1,733.00	1,742.98	1,735.77
P-10	I-10	I-9	80.00	480.00	0.016667	1	48 inch	0.023	8.05	1,733.00	1,725.00	1,735.71	1,728.27
P-34	I-9	J-13	118.00	300.00	0.016667	1	54 inch	0.023	9.64	1,725.00	1,720.00	1,728.20	1,723.27
P-35	J-13	I-8	118.00	300.00	0.016667	1	54 inch	0.023	9.05	1,720.00	1,715.00	1,723.20	1,718.75
P-36	I-8	J-14	163.00	363.00	0.022039	1	60 inch	0.023	11.39	1,715.00	1,707.00	1,718.66	1,710.22
P-37	J-14	I-7	163.00	339.00	0.022124	1	60 inch	0.023	9.44	1,707.00	1,699.50	1,710.66	1,705.46
P-32	I-7	J-12	208.00	500.00	0.023000	1	66 inch	0.023	10.99	1,699.50	1,688.00	1,703.54	1,692.13
P-33	J-12	I-6	208.00	500.00	0.019000	1	66 inch	0.023	10.53	1,688.00	1,678.50	1,692.04	1,683.03
P-30	I-6	J-11	250.00	500.00	0.019000	1	66 inch	0.023	12.08	1,678.50	1,669.00	1,682.91	1,673.54
P-31	J-11	J-10	250.00	500.00	0.018000	1	66 inch	0.023	11.75	1,669.00	1,660.00	1,673.42	1,664.85
P-29	J-10	I-5	250.00	500.00	0.016000	1	66 inch	0.023	11.38	1,660.00	1,652.00	1,664.74	1,656.84
P-26	I-5	J-9	291.00	500.00	0.016000	1	72 inch	0.023	11.70	1,652.00	1,644.00	1,656.72	1,649.18
P-27	J-9	J-8	291.00	500.00	0.014000	1	72 inch	0.023	11.49	1,644.00	1,637.00	1,649.08	1,641.99
P-25	J-8	I-4	291.00	500.00	0.015000	1	72 inch	0.023	11.52	1,637.00	1,629.50	1,641.88	1,634.68
P-22	I-4	J-7	355.00	500.00	0.016000	1	78 inch	0.023	12.67	1,629.50	1,621.50	1,634.55	1,626.68
P-23	J-7	J-6	355.00	500.00	0.016000	1	78 inch	0.023	12.67	1,621.50	1,613.50	1,626.55	1,618.68
P-21	J-6	I-3	355.00	280.00	0.016071	1	78 inch	0.023	12.30	1,613.50	1,609.00	1,618.55	1,614.54
P-18	I-3	J-5	422.00	420.00	0.015476	1	84 inch	0.023	13.07	1,609.00	1,602.50	1,614.41	1,608.04
P-19	J-5	J-4	422.00	400.00	0.016250	1	84 inch	0.023	13.00	1,602.50	1,596.00	1,607.91	1,601.60
P-17	J-4	I-2	422.00	500.00	0.015000	1	84 inch	0.023	12.90	1,596.00	1,588.50	1,601.47	1,594.13
P-14	I-2	J-3	450.00	500.00	0.016000	1	90 inch	0.023	12.81	1,588.50	1,580.50	1,594.00	1,586.13
P-15	J-3	J-2	450.00	320.00	0.015625	1	90 inch	0.023	11.79	1,580.50	1,575.50	1,586.00	1,582.37
P-13	J-2	J-1	450.00	500.00	0.007000	1	96 inch	0.023	9.87	1,575.50	1,572.00	1,582.37	1,578.76
P-1	J-1	O-1	450.00	109.00	0.004587	1	96 inch	0.023	11.25	1,572.00	1,571.50	1,578.68	1,576.90

Scenario: Base

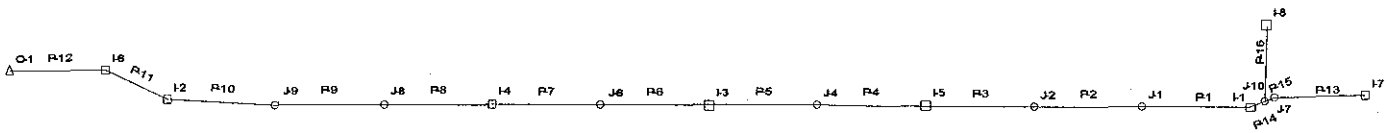


Scenario: Base

Pipe Report

Label	Upstream Node	Downstream Node	Total System Flow (cfs)	Length (ft)	Constructed Slope (ft/ft)	Number of Sections	Section Size	Mannings n	Average Velocity (ft/s)	Upstream Invert Elevation (ft)	Downstream Invert Elevation (ft)	Hydraulic Grade Line In (ft)	Hydraulic Grade Line Out (ft)
P-10	I-12	J-7	135.00	274.00	0.009854	1	54 inch	0.023	8.49	1,815.20	1,812.50	1,821.16	1,817.12
P-13	J-7	I-14	135.00	30.00	0.033333	1	60 inch	0.023	7.04	1,812.50	1,811.50	1,817.04	1,816.87
P-14	I-14	O-3	167.00	197.00	0.007614	1	60 inch	0.023	9.60	1,811.50	1,810.00	1,816.76	1,813.71

Scenario: Base



Scenario: Base

Pipe Report

Label	Upstream Node	Downstream Node	Total System Flow (cfs)	Length (ft)	Constructed Slope (ft/ft)	Number of Sections	Section Size	Mannings n	Average Velocity (ft/s)	Upstream Invert Elevation (ft)	Downstream Invert Elevation (ft)	Hydraulic Grade Line In (ft)	Hydraulic Grade Line Out (ft)
P-13	I-7	J-7	154.00	420.00	0.020238	1	60 inch	0.023	9.07	1,758.50	1,750.00	1,762.06	1,756.47
P-16	I-8	J-10	175.00	349.00	0.010029	1	72 inch	0.023	6.19	1,751.50	1,748.00	1,757.74	1,755.88
P-14	J-7	J-10	154.00	45.00	0.044444	1	60 inch	0.023	7.84	1,750.00	1,748.00	1,756.37	1,755.88
P-15	J-10	I-1	329.00	74.00	0.037838	1	78 inch	0.023	9.91	1,748.00	1,745.20	1,754.96	1,754.05
P-1	I-1	J-1	705.00	500.00	0.022200	1	90 inch	0.023	16.25	1,745.20	1,734.10	1,753.73	1,741.02
P-2	J-1	J-2	705.00	500.00	0.023400	1	90 inch	0.023	16.75	1,734.10	1,722.40	1,740.79	1,729.31
P-3	J-2	I-5	705.00	500.00	0.024400	1	90 inch	0.023	16.55	1,722.40	1,710.20	1,729.09	1,717.42
P-4	I-5	J-4	740.00	500.00	0.019000	1	96 inch	0.023	15.92	1,710.20	1,700.70	1,717.10	1,707.74
P-5	J-4	I-3	740.00	500.00	0.021800	1	96 inch	0.023	15.83	1,700.70	1,689.80	1,707.54	1,697.03
P-6	I-3	J-6	770.00	500.00	0.016800	1	102 inch	0.023	15.36	1,689.80	1,681.40	1,696.73	1,688.52
P-7	J-6	I-4	770.00	500.00	0.021200	1	102 inch	0.023	15.01	1,681.40	1,670.80	1,688.33	1,678.33
P-8	I-4	J-8	840.00	500.00	0.021800	1	102 inch	0.023	16.21	1,670.80	1,659.90	1,678.00	1,667.30
P-9	J-8	J-9	840.00	500.00	0.018400	1	102 inch	0.023	16.26	1,659.90	1,650.70	1,667.10	1,658.04
P-10	J-9	I-2	840.00	500.00	0.017000	1	108 inch	0.023	14.38	1,650.70	1,642.20	1,657.85	1,651.01
P-11	I-2	I-6	978.00	312.00	0.012821	1	114 inch	0.023	14.92	1,642.20	1,638.20	1,650.59	1,646.37
P-12	I-6	O-1	675.00	444.00	0.004955	1	10 x 4 ft	0.013	16.87	1,638.20	1,636.00	1,646.01	1,640.00

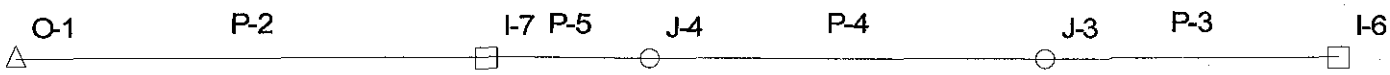
Scenario: Base

Scenario: Base

Pipe Report

Label	Upstream Node	Downstream Node	Total System Flow (cfs)	Length (ft)	Constructed Slope (ft/ft)	Number of Sections	Section Size	Mannings n	Average Velocity (ft/s)	Upstream Invert Elevation (ft)	Downstream Invert Elevation (ft)	Hydraulic Grade Line In (ft)	Hydraulic Grade Line Out (ft)
P-1	I-6	J-3	150.00	86.00	0.007209	1	48 inch	0.013	11.94	1,735.50	1,734.88	1,746.54	1,745.61
P-2	J-3	J-4	150.00	500.00	0.007240	1	48 inch	0.013	11.94	1,734.88	1,731.26	1,745.38	1,739.93
P-3	J-4	J-6	150.00	500.00	0.007240	1	48 inch	0.013	11.94	1,731.26	1,727.64	1,739.75	1,734.30
P-4	J-6	I-8	150.00	187.00	0.007273	1	54 inch	0.013	9.43	1,727.64	1,726.28	1,734.23	1,733.14
P-5	I-8	J-7	200.00	257.00	0.007237	1	60 inch	0.013	10.19	1,726.28	1,724.42	1,732.98	1,731.47
P-6	J-7	O-1	200.00	347.00	0.007205	1	60 inch	0.013	10.19	1,724.42	1,721.92	1,731.39	1,729.34

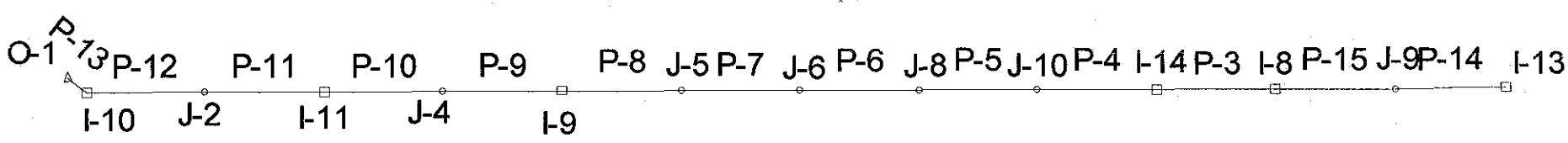
Scenario: Base



Scenario: Base

Pipe Report

Label	Upstream Node	Downstream Node	Total System Flow (cfs)	Length (ft)	Constructed Slope (ft/ft)	Number of Sections	Section Size	Mannings n	Average Velocity (ft/s)	Upstream Invert Elevation (ft)	Downstream Invert Elevation (ft)	Hydraulic Grade Line In (ft)	Hydraulic Grade Line Out (ft)
P-3	I-6	J-3	330.00	284.00	0.022042	2	54 inch	0.023	10.37	1,761.50	1,755.24	1,766.69	1,760.43
P-4	J-3	J-4	330.00	382.00	0.026021	2	54 inch	0.023	10.37	1,755.24	1,745.30	1,760.35	1,751.93
P-5	J-4	I-7	330.00	157.00	0.016561	2	60 inch	0.013	8.40	1,745.30	1,742.70	1,751.87	1,751.24
P-2	I-7	O-1	1,000.00	454.00	0.011454	2	78 inch	0.013	15.07	1,742.70	1,737.50	1,750.89	1,746.76

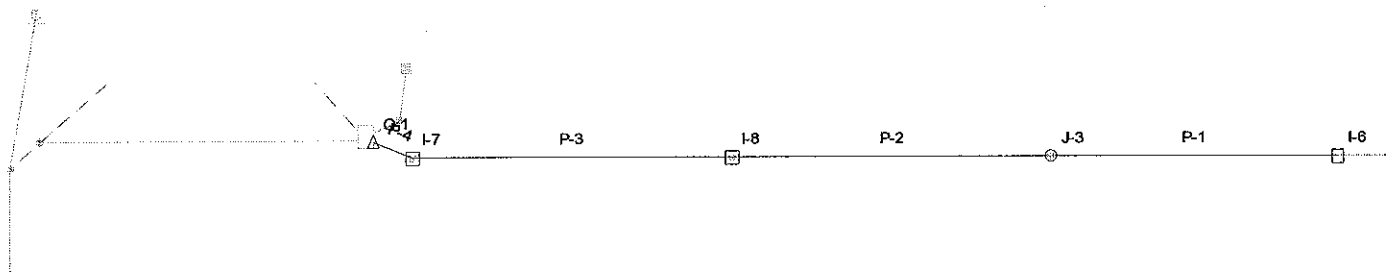

O-1
P-13
P-12
P-11
P-10
P-9
P-8
J-5
P-7
J-6
P-6
J-8
P-5
J-10
P-4
I-14
P-3
I-8
P-15
J-9
P-14
I-13
I-10
J-2
I-11
J-4
I-9

Scenario: Base

Pipe Report

Label	Upstream Node	Downstream Node	Total System Flow (cfs)	Length (ft)	Constructed Slope (ft/ft)	Number of Sections	Section Size	Mannings n	Average Velocity (ft/s)	Upstream Invert Elevation (ft)	Downstream Invert Elevation (ft)	Hydraulic Grade Line In (ft)	Hydraulic Grade Line Out (ft)
P-14	I-13	J-9	40.00	460.00	0.017391	1	36 inch	0.023	7.45	1,658.00	1,650.00	1,660.06	1,652.21
P-15	J-9	I-8	40.00	500.00	0.014800	1	36 inch	0.023	7.37	1,650.00	1,642.60	1,652.17	1,644.73
P-3	I-8	I-14	40.00	500.00	0.017000	1	36 inch	0.023	6.70	1,642.60	1,634.10	1,644.66	1,638.10
P-4	I-14	J-10	130.00	500.00	0.012600	1	54 inch	0.023	8.61	1,634.10	1,627.80	1,638.00	1,632.06
P-5	J-10	J-8	130.00	500.00	0.011600	1	54 inch	0.023	9.11	1,627.80	1,622.00	1,632.01	1,625.49
P-6	J-8	J-6	130.00	500.00	0.016000	1	54 inch	0.023	9.92	1,622.00	1,614.00	1,625.42	1,617.49
P-7	J-6	J-5	130.00	500.00	0.016000	1	54 inch	0.023	9.81	1,614.00	1,606.00	1,617.42	1,609.58
P-8	J-5	I-9	130.00	500.00	0.017000	1	54 inch	0.023	8.98	1,606.00	1,597.50	1,609.50	1,603.23
P-9	I-9	J-4	320.00	500.00	0.015400	1	72 inch	0.023	12.15	1,597.50	1,589.80	1,603.06	1,594.85
P-10	J-4	I-11	320.00	500.00	0.013600	1	78 inch	0.023	11.55	1,589.80	1,583.00	1,594.74	1,588.19
P-11	I-11	J-2	360.00	500.00	0.018000	1	84 inch	0.023	10.80	1,583.00	1,574.00	1,588.00	1,581.46
P-12	J-2	I-10	360.00	500.00	0.004000	1	90 inch	0.023	9.04	1,574.00	1,572.00	1,581.41	1,577.75
P-13	I-10	O-1	400.00	98.00	0.010204	1	90 inch	0.023	11.81	1,572.00	1,571.00	1,577.59	1,576.18

Scenario: Base

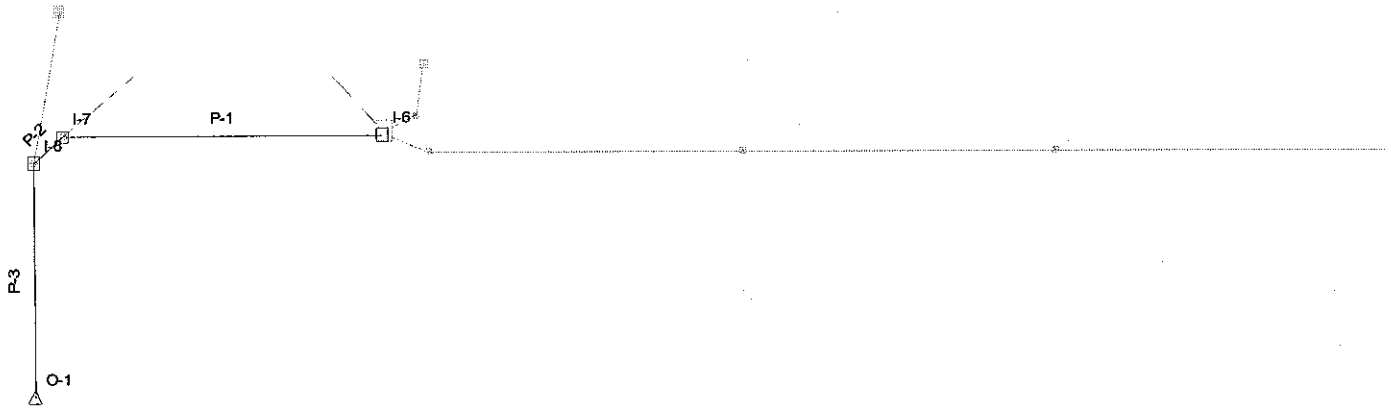


Scenario: Base

Pipe Report

Label	Upstream Node	Downstream Node	Total System Flow (cfs)	Length (ft)	Constructed Slope (ft/ft)	Number of Sections	Section Size	Mannings n	Average Velocity (ft/s)	Upstream Invert Elevation (ft)	Downstream Invert Elevation (ft)	Hydraulic Grade Line In (ft)	Hydraulic Grade Line Out (ft)
P-1	I-6	J-3	110.00	450.00	0.028667	1	48 inch	0.023	10.10	1,864.00	1,851.10	1,867.17	1,854.40
P-2	J-3	I-8	110.00	500.00	0.037600	1	48 inch	0.023	9.52	1,851.10	1,832.30	1,854.27	1,838.91
P-3	I-8	I-7	600.00	500.00	0.035600	1	84 inch	0.023	16.05	1,832.30	1,814.50	1,838.57	1,821.73
P-4	I-7	O-1	613.00	66.00	0.030303	1	90 inch	0.023	14.10	1,814.50	1,812.50	1,821.47	1,820.40

Scenario: Base



Scenario: Base

Pipe Report

Label	Upstream Node	Downstream Node	Total System Flow (cfs)	Length (ft)	Constructed Slope (ft/ft)	Number of Sections	Section Size	Mannings n	Average Velocity (ft/s)	Upstream Invert Elevation (ft)	Downstream Invert Elevation (ft)	Hydraulic Grade Line In (ft)	Hydraulic Grade Line Out (ft)
P-1	I-6	I-7	170.00	509.00	0.027898	1	48 inch	0.013	13.74	1,811.50	1,797.30	1,815.23	1,801.32
P-2	I-7	I-8	170.00	63.00	0.007937	1	54 inch	0.013	12.15	1,797.30	1,796.80	1,801.10	1,800.41
P-3	I-8	O-1	175.00	375.00	0.002133	2	54 inch	0.013	7.71	1,796.80	1,796.00	1,800.19	1,798.74

Spook Hill
McDowell and 88th Basin Splitter Structures

24" Pipe		36" Pipe		Total Pipe Flows			
Headwater Depth ft	Flow cfs	Headwater Depth ft	Flow cfs	Headwater Depth ft	Flow cfs		
1821	0	1821	0	1821	0		
1822	4.2	1822	0	1822	4.2		
1823	12.5	1823	0	1823	12.5		
1824	20.2	1824	6	1824	26.2		
1825	26	1825	18	1825	44.0	**total flow (cfs)**	**71**
1826	31	1826	35	1826	66.0	**stage (ft)**	**1826.26**
1827	35	1827	50	1827	85.0		

54" Pipe		2-84" Pipes		Total Pipe Flows			
Headwater Depth ft	Flow cfs	Headwater Depth ft	Flow cfs	Headwater Depth ft	Flow cfs		
1815.2	0	1815.2	0	1815.2	0		
1816.2	10	1816.2	14	1816.2	24		
1817.2	26	1817.2	66	1817.2	92		
1818.2	52	1818.2	128	1818.2	180		
1819.2	81	1819.2	228	1819.2	309	**total flow (cfs)**	**600**
1820.2	110	1820.2	340	1820.2	450	**stage (ft)**	**1823.2**
1821.2	135	1821.2	468	1821.2	603		
1822.2	159	1822.2	584	1822.2	743		

54" Pipe		2-84" Pipes		Total Pipe Flows			
Headwater Depth ft	Flow cfs	Headwater Depth ft	Flow cfs	Headwater Depth ft	Flow cfs		
1760	0	1760	0	1760	0		
1761	10	1761	14	1761	24		
1762	26	1762	66	1762	92		
1763	52	1763	128	1763	180		
1764	81	1764	228	1764	309	**total flow (cfs)**	**1046**
1765	110	1765	340	1765	450	**stage (ft)**	**1769.5**
1766	135	1766	468	1766	603		
1767	159	1767	584	1767	743		
1768	179	1768	704	1768	883		
1769	196	1769	794	1769	990		
1770	211	1770	894	1770	1105		

Spook Hill
Oak Street Basin Splitter Structure

48" Pipe		84" Pipe		Total Pipe Flows			
Headwater Depth ft	Flow cfs	Headwater Depth ft	Flow cfs	Headwater Depth ft	Flow cfs		
1810.5	0	1810.5	0	1810.5	0		
1811.5	8	1811.5	0	1811.5	8.0		
1812.5	23	1812.5	35	1812.5	58.0		
1813.5	46	1813.5	72	1813.5	118.0		
1814.5	71	1814.5	115	1814.5	186.0		
1815.5	95	1815.5	41	1815.5	136.0		
1816.5	112	1816.5	45	1816.5	157.0		
1817.5	132	1817.5	48	1817.5	180.0		
1818.5	146	1818.5	352	1818.5	498.0		
1819.5	159	1819.5	398	1819.5	557.0	**total flow (cfs)**	**613**
1820.5	172	1820.5	448	1820.5	620.0	**stage (ft)**	**1820.4**

Spook Hill
McDowell and Ellsworth Basin Splitter Structures

102" Pipe		102" Pipe		Total Pipe Flows			
Headwater Depth ft	Flow cfs	Headwater Depth ft	Flow cfs	Headwater Depth ft	Flow cfs		
1829	0	1829	0	1829	0		
1830	10	1830	0	1830	10		
1831	38	1831	10	1831	48		
1832	83	1832	38	1832	121		
1833	140	1833	83	1833	223		
1834	207	1834	140	1834	347		
1835	280	1835	207	1835	487		
1836	358	1836	280	1836	638		
1837	436	1837	358	1837	794		
1838	513	1838	436	1838	949	**total flow (cfs)**	**1061**
1839	585	1839	513	1839	1098	**stage (ft)**	**1838.75**

36" Pipe		84" Pipe		Total Pipe Flows			
Headwater Depth ft	Flow cfs	Headwater Depth ft	Flow cfs	Headwater Depth ft	Flow cfs		
1825	0	1825	0	1825	0		
1826	7	1826	0	1826	7		
1827	20	1827	10	1827	30		
1828	41	1828	34	1828	75		
1829	60	1829	71	1829	131		
1830	77	1830	116	1830	193		
1831	90	1831	167	1831	257		
1832	105	1832	219	1832	324		
1833	115	1833	271	1833	386		
1834	125	1834	312	1834	437		
1835	100	1835	360	1835	460		
1836	106	1836	397	1836	503	**total flow (cfs)**	**570**
1837	112	1837	486	1837	598	**stage (ft)**	**1836.71**
1838	158	1838	461	1838	619		

Spook Hill
76th and McDowell Basin Splitter Structure

12 x 4 CBC		78" Pipe		Total Pipe Flows	
Headwater Depth ft	Flow cfs	Headwater Depth ft	Flow cfs	Headwater Depth ft	Flow cfs
1638.2	0	1638.2	0	1638.2	0
1639.2	36	1639.2	0	1639.2	36
1640.2	98	1640.2	0	1640.2	98
1641.2	176	1641.2	0	1641.2	176
1642.2	267	1642.2	9	1642.2	276
1643.2	348	1643.2	34	1643.2	382
1644.2	408	1644.2	71	1644.2	479
1645.2	475	1645.2	116	1645.2	591
1646.2	535	1646.2	166	1646.2	701
1647.2	588	1647.2	218	1647.2	806
1648.2	638	1648.2	270	1648.2	908
1649.2	682	1649.2	312	1649.2	994
1650.2	725	1650.2	360	1650.2	1085
1651.2	765	1651.2	396	1651.2	1161

total flow (cfs)	**978**
stage (ft)	**1649**

Spook Hill
School Basin Splitter Structure

48" Pipe		2-84" Pipes		Total Pipe Flows			
Headwater Depth ft	Flow cfs	Headwater Depth ft	Flow cfs	Headwater Depth ft	Flow cfs		
1735.5	0	1735.5	0	1735.5	0		
1736.5	8	1736.5	0	1736.5	8.0		
1737.5	23	1737.5	0	1737.5	23.0		
1738.5	46	1738.5	14	1738.5	60.0		
1739.5	71	1739.5	66	1739.5	137.0		
1740.5	95	1740.5	128	1740.5	223.0		
1741.5	112	1741.5	228	1741.5	340.0		
1742.5	131	1742.5	340	1742.5	471.0		
1743.5	145	1743.5	468	1743.5	613.0		
1744.5	158	1744.5	584	1744.5	742.0		
1745.5	170	1745.5	700	1745.5	870.0		
1746.5	182	1746.5	788	1746.5	970.0	**total flow (cfs)**	**1000**
1747.5	193	1747.5	890	1747.5	1083.0	**stage (ft)**	**1746.77**

1" = 200'

Q = 200 gpm

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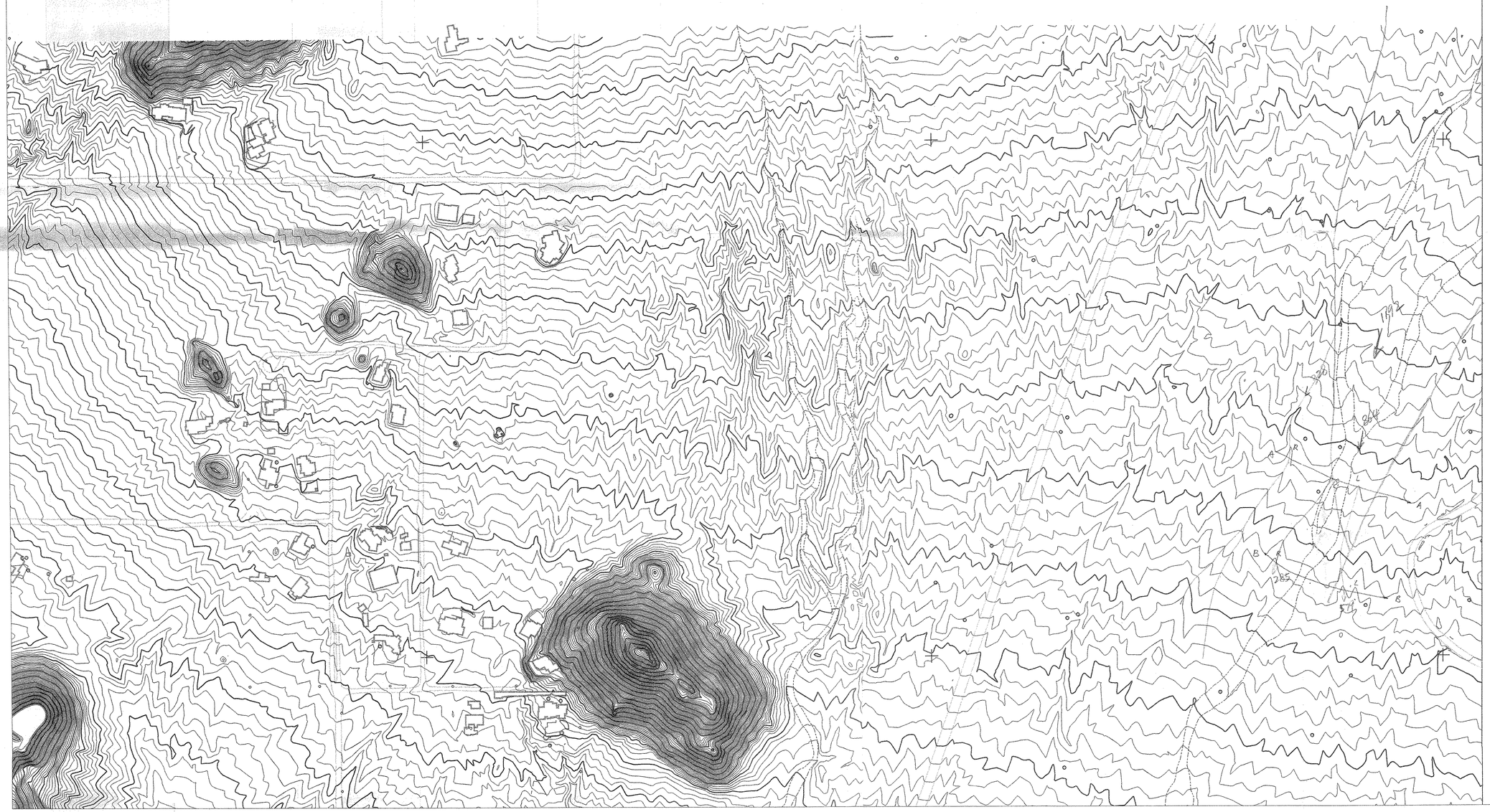
Subbasin 350 split Flow



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